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JOHN AITKEN, M.D.

ESSAYS
ON
FRACTURES
AND
LUXATIONS.

BY

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A NEW EDITION.

ILLUSTRATED WITH ELEVEN PLATES.

LONDON:
Printed for T. Cadell, Strand, and J. Fairbairn,
EDINBURGH.
1800.

PREFACE.

THE Eſſay on Fractures was publiſhed many years ago; and although ſo well received, that the Edition was ſoon ſold off, yet being much engaged, I did not find leiſure to republiſh it ſooner, with the improvements that farther experience had ſuggeſted.

As the doctrines of Fracture and Luxation have a ſtrong affinity to one another, it was ſuppoſed, that it might not be improper to conjoin them: An Eſſay on Luxation, therefore, follows that on Fracture.

I have ſtudied perſpicuity in ſtyle, and ſimplicity in doctrine; recollecting, that the end of the eighteenth century is high time to exhibit the uſeful ſciences entirely undiſguiſed.

Future writers on the ſubjects of theſe Eſſays may perhaps make uſeful additions, according as experience and ſcientific progreſs ſhall enable them; but I am humbly of opinion, that it will not be ſoon in their power to deviſe modes of cure more ſimple and efficient than thoſe deſcribed in the following pages.

J. A.

T O

LORD GARDENSTON,

One of the

SUPREME JUDGES OF SCOTLAND, &c,

MY LORD,

ALTHOUGH I have ſcarcely the honour to be known to you, I have nevertheleſs preſumed to inſcribe the following Eſſays to your Lordſhip; becauſe, when I looked around among my countrymen for an illuſtrious name to grace this little Work, I found none more juſtly eminent and celebrated than yours. For who is to be informed of the fair and high reputation of the moſt reſpectable and worthy Lord Gardenston? An enlightened, impartial, and manly Judge; a patriotic Citizen; the munificent Patron of Merit; and the ſteady Friend of Liberty and of Man.

> Whose open stores,
> Tho' vast, are little to his ampler heart,
> The Father of a Country!

That your Lordſhip may long live an ornament to human nature, exhibiting to Society a venerable ſyſtem of ſublime, grand, liberal, and virtuous manners, is the ſincere wiſh of,

My Lord,

Your diſintereſted Admirer,

and devoted humble Servant,

JOHN AITKEN.

Edinburgh,
Dec. 1789.

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ON

OF FRACTURES.

INTRODUCTION.

THE bones, when perfect or mature, are whitiſh, rigid, brittle, in a great meaſure inſenſible, and of various forms. Their external part, the moſt denſe and ſolid, is compoſed of plates, or laminæ; therefore named laminated. Their internal ſubſtance is more looſe and cellular; and, on account of its reſemblance to lettice-work, or cancelli, may be denominated cancellated. In the long and round bones of the extremities, this matter is ſo diſpoſed, that there is a ſpace in the middle of each leſs ſtored with it than elſewhere; on which account they have been called Fiſtulous bones.

The external ſurface of the bones is almoſt univerſally covered by a denſe membrane, the Perioſteum, ſeemingly continued from one to another over the whole; to which it is moſt firmly connected by numerous veſſels and fibres.

The internal or cancellated ſubſtance ſupports a cellular membrane, ſui generis, commonly called Internal Perioſteum; but which with more juſtice may be named Medullary Membrane, as its cells contain, and probably prepare, the oil, marrow, or medulla of the bones.

Along this membrane, numerous blood-veſſels are diſperſed; which, communicating with the vaſcular ſyſtem by trunks more or leſs conſiderable, tranſmitted in channels evident in the laminated ſubſtance, ſupport a circulation of the blood within the bones.

Although nerves have not been pointed out in the bones with ſufficient preciſion, yet there is reaſon to conclude, that they are not deſtitute of them. Granulations ariſing from bones ſeem to have acute feeling; and it may be admitted as a principle in Phyſiology, That where-ever function exiſts, there its organ muſt alſo exiſt.

The bones in proper union form a ſyſtem named Skeleton, which greatly reſembles the figure of the individual to which it belongs; ſo that it may be affirmed, that they are eſſential to our ſtability in the various attitudes; while at ſame time they contribute greatly to preſerve the juſt diſpoſition and arrangement of the numerous parts and organs that complete the animal: hence proportional diſorder is conſtantly preſent where their ſtructure is impaired, as in all the degrees of mollities oſſium.

With reſpect to the muſcles, which in fact are a moſt aſtoniſhing ſyſtem of ſprings, or elaſtic machines, the bones may be conſidered as ſo many levers of indiſpenſable uſe, eſpecially in locomotion, in the more perfect animal.

As ſervices ſo important and eſſential are thus performed by the bones, it is evident, that their fractures muſt be inſtantaneouſly productive of the greateſt diſqualifications. It therefore ever has been, and muſt be, no inferior department in Surgery, to conduct their cure with propriety, ſo as to reſtore and preſerve, as may be poſſible, the functions and form of the parts concerned. To unfold the principles of this great buſineſs, is the ſubject at preſent in view.

Although the idea conveyed by the term Fracture, employed to expreſs a common diſeaſe of the bones, may ſeem very familiar even to the Tyro in Surgery; yet, for his amuſement, if not information, I judge it to be no way improper to offer a definition of this term, and alſo to ſubjoin a few phyſiological and pathological remarks, which appear to have a conſiderable connection with our ſubject, and which may throw light on the cure of Fracture, which is, as it ought to be, our chief object in this Eſſay; in which I wiſh it to be remembered, that I principally keep in view Fractures of the long bones of the extremities: at ſame time it is plain, that general principles, to a certain degree, apply univerſally.

DEFINITION OF FRACTURE.

"A diviſion of a bone, by violence, into two "or more fragments, with injury of the adjacent "parts," is a definition of Fracture perhaps ſufficiently accurate and comprehenſive. It excludes diviſions by caries or the like.

If a power act on any piece of matter, ſo as to diſtract its component particles beyond a certain degree, a diviſion into two or more portions is the unavoidable conſequence. When the animal ſubſtance is thus affected, according to its texture, the change produced is named Wound, Laceration, Rupture, or Fracture. The laſt term is chiefly confined to the bones, as above ſtated.

OF THE DISTINCTIONS OF FRACTURE.

Six diſtinctions or varieties of Fracture may be uſefully adverted to.

1. Simple, when the adjacent ſoft parts are not much wounded, at leaſt the wound is not viſible.

2. Tranſverſe, when the line of ſolution is at right angles with the axis of the affected bone.

3. Oblique, when this line makes acute angles with the axis of the bone.

4. Complicated, when a bone is broken in more places than one at the ſame time.

5. Comminuted, when the fragments are numerous.

6. Compound, when the parts adjacent to

the Fracture are wounded, eſpecially if this has been done by a fragment protruded, and thereby become viſible.

It is evident, that the tranſverſe ſimple fracture, ſtrictly conſidered, admits of no variety, while the oblique one may be ſimple or compound, and of many degrees; and if we reſtrict the compound fracture to denote an accompanying wound, inflicted by a fragment viſibly protruded, there muſt be as many degrees of ſimple fracture as there are of violation ſuſtained by the adjacent ſoft parts. Theſe circumſtances are well worth the attention of the Surgeon when employed in collecting a diagnoſis, or forming a prognoſis of any caſe of fracture.

OF THE COHESION OF THE OSSEOUS SUBSTANCE.

THE coheſion of the ultimate parts of any aggregate or maſs of matter muſt be the effect of attraction, which may be conſidered as their connecting medium in all bodies, whether organiſed or not, and conſequently in bones.

Although the coheſion ſubſiſting among the particles of the bones of old animals may be greater than that of thoſe of younger ones; yet it would appear, that, ceteris paribus, the former are more fragile than the latter.

This difference, ſuppoſing it to exiſt, is to be referred to a pliancy of the younger bones, derived from their abounding leſs with ſolid parts than aged bones, which the oſſific proceſs is conſtantly accumulating.

In conſequence of this pliancy, young bones elude the effect of ſtrokes, and the like, which may be ſtyled a vis percutiens, although acting in a degree that might fracture old bones, in which the coheſion may be preſumed to be greater; while the latter would probably reſiſt a vis diſtrahens in a greater degree than the former could do.

This pliancy inherent in young bones unqueſtionably is derived from ſuperior vaſcularity and ſucculency; for the bones of the fœtus reſemble ſomewhat a jelly, or gluten, intermixed with veſſels, by whoſe action, undoubtedly, it and the other component parts are prepared, and effuſed; among which the oſſeous matter that produces the rigidity of bones, is gradually and organically depoſited. In the broad bones it appears in points called Centres, or Nuclei: in the middle of a long bone, in the form of a ring, and at ſame time an oſſification takes place at each end, forming the epiphyſes, while the middle one produces the body of the bone. Theſe by degrees meet and unite.

OF THE RIGIDITY OF BONES.

IT follows from what is premiſed, that as the pliancy of growing bones depends on comparative vaſcularity and ſucculency, the rigidity ſo characteriſtic of mature and old bones, reſults from the accumulation of oſſeous matter depoſited perhaps interſtitially, by the oſſific action of their veſſels; to this the rigidity proportionally ſucceeds.

It is not improbable, that Nature, ever attentive to the preſervation of the individual, compenſates the loſs of pliancy poſſeſſed by young bones, by the greater coheſion enjoyed by mature and old ones.

The greateſt reſiſtance which the bones can oppoſe to violences tending to fracture them, ſeems, not to reſult either from their pliancy or rigidity ſingly conſidered, but from a combination of both; and this may juſtly be preſumed to be moſt complete at that period when the ſyſtem is fully evolved, viz. at puberty.

It may be added, that it is pretty certain, that from the firſt moment of exiſtence to the laſt one, the animal body is continually ſuffering a loſs of vaſcularity and ſucculency; and this change takes place, not in the bones only, but in the other parts proportionally, in all probability by the accumulation of earthy matter; ſo that, in conſequence of the inſeparable connection between organ and function, already mentioned, our powers are gradually loſt, and animation ſpontaneouſly terminates. This is what is properly called natural death.

OF THE MARROW OR OIL OF THE BONES.

To ward off as long as long as poſſible the effects of diminiſhed vaſcularity and ſucculency, Nature has provided a ſtore of oil or marrow in the cancellated parts of all bones, and ſeemingly in proportion to their various exigencies. The encreaſe of this keeps pace with their diminution.

It has been already ſuggeſted, that the oil of bones is fabricated by their veſſels; and this muſt be the fact; for there is no other agent; and perhaps this oil is capable of pervading the laminated ſubſtance; at leaſt this certainly happens after death.

The equitable diffuſion of this oil, which we may ſuppoſe to take place, tends to retard the fragility, and the other changes induced by age. In advanced life, therefore, the reſiſtance of bones to fracturing powers may be referred, in no ſmall degree, to their marrow, which begins to abound when, on this ſuppoſition, its preſence is neceſſary.

It is alleged, that when extreme old age advances, even this oil becomes deficient; an event to be aſcribed to the change of the medullary veſſels; for ſpecific ſtructure being loſt, ſpecific action muſt be likewiſe loſt. This circumſtance, perhaps, explains the cauſe why in very old ſubjects, the bones are comparatively brittle, and when fractured, admit of healing with difficulty.

It may be further remarked, that if the reſiſtance of bones to fracturing cauſes depends in any degree on their oil, that which affects their oil in quantity or quality will diminiſh their reſiſtance: A circumſtance not to be overlooked in the conſideration of the prediſpoſing cauſes of fracture.

OF THE CAUSES OF FRACTURE.

CAUSATION is one of the moſt intereſting topics in philoſophy, and eſpecially in Medicine: for till the cauſes of diſeaſes are inveſtigated, as far as their nature admits of, we cannot hope to be able to apply proper remedies.

Whatever has the effect to encreaſe the fragility of the bones muſt be a prediſponent cauſe of fracture. It has been already remarked, that this takes place in conſequence of a loſs of vaſcularity and ſucculency; and it may be added, of diſeaſes which affect the fluids, eſpecially the gluten and marrow.

1. Old age and long-continued and hard labour are ſuppoſed to prediſpoſe to fracture, in the way ſtated above.

2. If the pliancy or tenacity of bones depends in any degree on their gluten and marrow, it may be concluded, that diſeaſes which vitiate theſe

component parts muſt proportionally induce fragility; of which the following may be named: The ſyphylitic, or venereal; the ſcorbutic, or putreſcent; the arthritic, or gouty; the ſtrumous, or ſcrophulous; the rachitic, or rickety; and the carcinomatous, or cancerous.

It would doubtleſs be foreign to the plan of this Treatiſe, to attempt a particular inquiry into the natures of theſe diſeaſes; it may be ſufficient in general to ſtate, that it is highly probable, that acrimony, of various quality and degree, is generated by the vitiation of the veſſels; and this produces the fragility in queſtion; for in ſome caſes the texture of the bones has thus been ſo perverted, that fracture has occurred from the ſmalleſt attempt to riſe, ſtand, or walk.

An intenſely cold or froſty atmoſphere has been imagined capable to render the bones more than ordinarily brittle. The frequency of fractures during froſty weather ſeems to have given riſe to this opinion; but it ſhould be remembered, that the great hardneſs and ſlipperineſs of the ground in froſt are ſufficient to account for this fact, without an encreaſed fragility; and that, while the body in general is healthy, and the circulation of the blood duly performed, the temperature of the bones cannot be altered; or, in other words, they cannot be frozen.

External violence is the occaſional cauſe of thoſe fractures intended to fall under our definition, and to which of courſe our remarks principally apply; for thoſe that are chiefly induced by the prediſpoſing cauſes enumerated, are in fact not idiopathic, but ſymptomatic affections, and require, previous to their cure, that the primary diſeaſes be removed: Therefore it is, that the treatment of the former moſt properly falls within the Surgeon's province. The truth is, that external violence, ſuppoſed to be the occaſional cauſe of idiopathic fracture, is often ſo great as to require no aſſiſtance from prediſpoſition. A like remark may be made with reſpect to the occaſional cauſes of many other diſeaſes.

It appears to be an incontrovertible propoſition in pathology, That the proximate cauſe of a diſeaſe is the change or derangement induced by the remote cauſes, which comprehend the prediſponent and occaſional ones: therefore the proximate cauſe of fracture is a linear ſolution of the oſſeous ſubſtance.

In many of the chirurgical diſeaſes, the proximate cauſe, like that of fracture, is palpable and evident; but it does not follow, that in the general or internal diſeaſes, it is not alſo a ſpecific derangement, or peculiar morbid condition, producing the ſymptoms; although, from the minuteneſs of the organization of the ſeats of ſuch diſeaſes, this cannot be defined with equal preciſion.

OF THE SYMPTOMS OF FRATURE.

IF the violence, or occaſional cauſe of the fracture, has wounded the integuments or muſcular parts, or if a fragment is puſhed through, ſo as to be ſeen or felt, it is a caſe of compound fracture, as defined above, and is ſelf-evident.

Although the compound fracture cannot be miſtaken by the leaſt verſant in our ſubject, yet the caſe is far otherwiſe with regard to ſimple fracture; for in numberleſs inſtances it has been overlooked, and the miſtake diſcovered too late to admit of remedy. Some circumſtances indeed, ſuch as the natural thickneſs of the parts ſurrounding the fracture, corpulency, ſwelling, and tenſion, often occaſion abundant perplexity in aſcertaining the diagnoſis even to the beſt informed and moſt experienced Surgeon. It therefore becomes neceſſary to enumerate the principal diagnoſtics: it is ſuppoſed that an adequate occaſional cauſe has operated.

1. Very acute and pungent pain, eſpecially where the ſuſpected part is moved or compreſſed by the hand or otherwiſe. This ariſes from the direct and ſtrong ſtimulus of the fragments acting on the muſcles and nerves, alſo from the derangement of the medullary membrane, perioſteum, muſcles, and nerves, ſituated near the fracture.

2. A mutual friction or grating of the fragments, often very perceptible to the touch, and ſometimes audible. This ſymptom alone is deciſive evidence, or abſolutely pathognomonic.

3. Deformity of the ſuſpected part or limb, more or leſs conſiderable, ſuch as curvature, ſhortening, &c. This circumſtance is eſpecially recogniſed when the fracture happens to be oblique,

lique, and the inferior fragments diſplaced. In the purely tranſverſe one, ſometimes this ſymptom is not preſent.

4. Loſs of motion, or comparative inability to uſe the limb, eſpecially below the ſuppoſed ſeat of the fracture. This ariſes from the derangement and leſion of adjacent and perhaps adhering muſcles, particularly thoſe attached to the inferior fragments.

5. Swelling and tenſion of the parts ſurrounding the ſuſpected bone in various degrees. It appears from innumerable facts, that there is an indiſſoluble relation between acute pain and ſwelling; this laſt being nothing other than a determination or afflux of blood to the pained or irritated part. It ſeems to be what Wiſeman and his cotemporaries called a Fluxion; which may perhaps be explained in this way.

The motion of the blood is entirely occaſioned by the action of its veſſels, which is as the irritation to which they are ſubjected. When this action is morbidly increaſed, the blood is proportionally propelled, the exhalants opening into the cellular ſubſtance effuſe more than uſual, while the abſorbents take up leſs. This accumulation ſoon affects the veſſels, diſturbing, as would ſeem, but not diminiſhing their action, while the tranſmiſſion is impeded. Thus neceſſarily the tumefaction in queſtion is produced.

This ſtate of a pained part, when the ſtimulus is ſtrong, is frequently changed into inflammation, which, as will appear hereafter, is an unfortunate circumſtance.

At other times this ſwelling partakes of the nature of ecchymoſis, being ſuddenly produced by ruptured veſſels pouring their blood into the cellular ſubſtance, according to the degree of injury ſuſtained by the ſoft parts, whether from the action of the occaſional cauſe, or the diſlocation of a pointed fragment. This alſo readily paſſes into the inflamed ſtate.

The only diſeaſes with which ſimple fracture is likely to be confounded, are luxation and contuſion.

Luxation is neceſſarily ſeated in a joint. By this circumſtance a diſcrimination may be made.

Indeed ſometimes fracture and luxation are combined. Contuſion does not produce curvature or ſhortening of the limb: there can be no friction as above deſcribed; and the pain is not ſo much aggravated as in fracture.

Anatomy is here of indiſpenſible utility, as well to the patient as Surgeon; enſuring, in a great meaſure to the former a ſucceſsful management, and to the latter honour and ſatisfaction.

OF THE PROGNOSIS.

THE ſimple tranſverſe fracture is ofteneſt ſpeedily and happily cured. On the other hand, the cure of the oblique one much ſeldomer terminates agreeably to the wiſhes of the patient and Surgeon: ſo that deformity, or loſs of function in various degree is too frequently the conſequence.

This reſult would ſeem to be, cæteris paribus, as the obliquity; for when this is conſiderable, the fragments are with difficulty preſerved in proper appoſition; and their extremities being pointed, prove more ſtimulant, and deſtructive to the fleſhy parts.

The proximity of a joint, on account of the peculiar nature of its conſtituent parts, cannot fail to encreaſe the danger that otherwiſe would attend any fracture; for inflammation and effuſion here muſt be peculiarly pernicious.

It may be needleſs to obſerve, that as the danger is almoſt as the number of fragments, the complicated and comminuted muſt be liable to greater accidents, viz. ſwelling, inflammation, &c. than the ſtrictly ſimple fracture.

Fractures are more or leſs dangerous and moleſting, according to the degree of violation which the ſurrounding parts have ſuſtained: therefore compound are univerſally more dangerous than ſimple fractures.

OF THE NATURE AND FORMATION OF CALLUS.

The Author of nature has wiſely and wonderfully implanted powers in the animal and vegetable ſyſtems capable of repairing loſs of ſubſtance and other injuries which they may ſuffer, to a certain extent, and under certain circumſtances. Of theſe, ſurpriſing exertions are every day to be obſerved; but no inſtances of this kind are more remarkable than the exfoliation, and conſequent regeneration of large portions of the bones, and the firm re-union of their ſeveral pieces after fracture.

The ſubſtance, by whoſe intervention the concretion of the fragments of the bones is partly effected, is named Callus.

Authors are much divided about the ſource whence the callus flows: while M. de Hamel contends, that it is furniſhed ſolely from the perioſteum, the learned and indefatigable Haller, and Camper, with greater probability, aſſert, that it is only effuſed from the ſubſtance of the fractured bones. Indeed the latter talks of a double callus; one part external, formed between the perioſteum and the laminated ſurface; and another internal, or the ſeparation and elongation of the laminæ.

The young callus, however, never aſſumes the oſſeous nature, till it has been pervaded by the oſſific veſſels, ſhooting from the neighbouring parts, which unqueſtionably had effuſed it, like as the inflammatory action of the veſſels of the ſofter parts, forms and pours out pus. By this means it acquires an organization analogous, tho' inferior in degree to that which the bones naturally enjoy.

The morbid ſtates of the ſyſtem already enumerated, as prediſponent to fracture, alſo greatly influence the formation of callus. Sometimes they not only retard, but altogether prevent it. The ſcorbutic diatheſis is particularly fatal to the growth of callus; it has been obſerved to deſtroy it in its moſt confirmed ſtate; fractures, after having been re-united for many years, have appeared in conſequence of this affection as if recent.

It is alledged, that the ſtate of pregnancy is unfavourable to the production and perfecting of callus; and, for this reaſon, fractures happening during that condition are ſaid to admit only of very ſlow cure.

The time requiſite to confirm or perfect the callus, after fractures, muſt be different in the different bones; and in patients of different ages and conſtitutions: At a medium, it has been ſuppoſed, that the fractured radius may unite within four weeks; the ulna and humerus within ſix; and the os femoris ſeldom under ſeven, or perhaps ten weeks.

As the formation of callus is altogether Nature's work, and cannot be influenced by artificial means, the abſurdity of all topical and quackiſh applications, as well as internal remedies,

dies, with a view to haſten it, or, when formed, to diſſolve or ſoften it, is too ſelf-evident to require illuſtration.

OF THE METHOD OF CURE, OR TREATMENT OF FRACTURES.

AFTER being fully convinced, from the concomitant ſymptoms, that a bone is fractured, the Surgeon's buſineſs is, to reduce its fragments to their natural ſituation; and there to retain them, by proper means, till the healing power, by the interpoſition of callus, completes the cure. Indeed, under the beſt menagement, this is ſometimes prevented by the interpoſition of membrane or muſcle.

This part of our ſubject naturally divides itſelf into three branches; Extenſion, Coaptation, and Retention. And theſe, well effected, conſtitute what may be called the Artificial or Chirurgic cure, which is ſubſervient, although not eſſential, to what may, in oppoſition, be termed the Natural cure.

EXTENSION.

THE contradictility, or vis inſita, of the muſcular fibres, during life, is conſtantly exerted, or the muſcles have a conſtant tendency to ſhorten themſelves, as far as their ſtructure permits: this is only prevented, beyond a certain degree, by the reſiſtance which the bones oppoſe to it. When, the bones are fractured obliquely, or indeed tranſverſely, provided the fracturing cauſe has ſufficiently diſengaged the fragments from one another, this reſiſtance will be in, a great meaſure, removed; at the ſame time that the muſcular power, from the ſtrong and rude ſtimulus of the fragments, is much encreaſed: by this means the lower fragments are very often forced to over-lop the upper ones. To reduce theſe, extenſion becomes abſolutely neceſſary, and ought to be proportioned to the reſiſtance, which is as the connecting and acting muſcles.

In ſome favourable tranſverſe fractures, no diſplacement of the fragments enſues. This circumſtance plainly ſuperſedes the neceſſity of extenſion.

As the deſign of extenſion is to reduce the lower fragments, which, for reaſons adduced, can only be diſplaced, it is eaſy to perceive, that there can be no neceſſity for what is called Counter-extenſion. If any idea is conveyed by this term, it ſeems only to be the retracting of the upper fragments,

In performing extenſion, the upper fragments muſt be fixed, or held ſteadily in one poſture. The traction, or extending power, whether the hands or mechanical aſſiſtance, is to be applied to the lower fragments only; for no good reaſon can be aſſigned, why, by applying it to a more diſtant part of the limb, the intervening articulations ſhould be racked and ſtrained, and perhaps luxation added to fracture.

For another and perhaps more important reaſon, the application of the extending power to a diſtant part of the limb, is highly improper and unſcientific, viz. the muſcles, by this procedure, are all put on the ſtretch, and their tenſion infallibly increaſed; and conſequently the reſiſtance to the traction much augmented, which by every poſſible means ſhould carefully be diminiſhed.

A conſiderable relaxation of the muſcles of the leg and arm is obtained, by keeping the knee and elbow joints in a ſtate of ſemiflexion while extenſion is performing. This circumſtance deſerves to be particularly attended to. If a joint intervenes betwixt the fracture and the part to which the extending power is applied, a few ſuppoſable caſes excepted, this relaxation is not to be obtained.

Although this practice of relaxing the muſcles to facilitate the extenſion, as well as retention of fractured bones, ſtands ſupported by anatomical arguments and common ſenſe, it has been much overlooked by the generality of authors. Some, indeed, have mentioned it; but the many advantages reſulting from it have never been fully taught by any author, ſo far as we know, before Mr Pot; to whoſe judicious obſervations on this and other ſubjected, ſurgery is much indebted.

To accompliſh extenſion, our tractive efforts ſhould at firſt be gentle, cautious, and ſteady; and, as may be neceſſary, gradually encreaſed. The ſtrength of the hands will almoſt always be found ſufficient for this purpoſe; where it is ſo, it is conſtantly to be preferred to every contrivance whatever. In fractures of the thigh-bone, whoſe ſurrounding muſcles are by far thicker and ſtronger than any other part of the extremities, I have always, with one or two aſſiſtants, been able to effect due extenſion; though, at the ſame time, I am far from doubting, that, in ſome muſcular robuſt patients, the aſſiſtance of the mechanical powers may be found neceſſary; eſpecially when the neck of the thigh-bone is the ſeat of the fracture.

It is very material, carefully to attend to the proper time of operating the extenſion; it ſhould always be performed as ſoon after the accident as poſſible, previous to the acceſſion of the tenſion and inflammation. If, however, theſe are preſent in any conſiderable degree, before aſſiſtance has been procured, it will in general be prudent not to attempt extenſion till theſe ſymptoms are either mitigated or altogether removed; otherwiſe our attempts may not only prove vain, but extremely hurtful; for from ſuch procedure an increaſe of the ſymptoms is but a natural conſequence.

The tenſion and inflammation are moſt likely to be mitigated or removed by a ſtrict obſervance of the antiphlogiſtic regimen in all its parts, particularly blood-letting. In ſanguine, robuſt, young habits, copious blood-lettings, both general and topical, are indiſpenſible; for no remedy whatever ſo effectually reduces the tone of the arterial ſyſtem, or ſo powerfully deſtroys the inflammatory diatheſis. As very much contributing to the ſame end, the application of large emollient or relaxant cataplaſms to the fractured part is to be perſiſted in. Theſe, in fact, are the tepid bath in its beſt form, whether we conſider the effect or the conveniency of applying it. In may be added, the leſs it is compounded the better.

For determining the quantity of extenſion, the rule is, to proceed till the next ſtep in the curative proceſs can be properly accompliſhed, viz.

COAPTATION.

COAPTATION, or ſetting of the reduced fragments, ought to be executed with all poſſible accuracy and attention; for on it the future ſhape, and perhaps uſefulneſs of the limb, may in a great degree depend.

Accurate anatomical acquaintance with the ſtructure of the parts concerned, will here be the Surgeon's beſt aſſiſtant; ſome information may be gained by carefully comparing the affected with the correſponding ſound limb.

The other ſteps in the treatment of fractures are, as it were, only ſubſervient to coaptation: For by extenſion the limb is reſtored to its due length; but by coaptation it regains its natural form; which we endeavour to maintain by the laſt ſtep, or

RENENTION.

After coaptation, properly to effect the retention of the fragments, is by far the moſt arduous part of the Surgeon's taſk, in the management of fractures; unſucceſsfulneſs in this point fruſtrates all his former labour, and often ſubjects him to the moſt mortifying reflections. Although the diſtortion and deformity, which muſt be the unavoidable conſequence of failure here, may in juſtice be ſolely imputable to the imprudent conduct of the patient; or may be the effect of accidents unforeſeen, or not to be prevented; yet the inconſiderate part of mankind, which is by no means the leaſt numerous, will, without heſitation, ſtate the whole blame to the Surgeon's account.

Some of the chief ſources whence the difficulty of retention flows, are the following:

1. The thickneſs of the ſurrounding muſcles. This circumſtance, beſides increaſing the the muſ-

cular ſtrength or contractile power, by which the fragments are diſplaced, adds to the difficulty in another way. By it our retentive applications are kept at too great diſtance from the fractured bones, whereby their influence is either diminiſhed or totally deſtroyed: ſo that when they are made with as great ſtricture as is compatible with the ſafety of theſe ſurrounding parts themſelves, little or no reſiſtance is oppoſed to the derangement of the fragments. This is peculiarly the caſe in the thigh; for this reaſon, by Hildanus it is compared to a bone ſurrounded with a thick pillow.

2. The obliquity of the fracture. Nothing can be more evident than that the greater this obliquity is, the contractility of the muſcles, and deragement of the fragments, will be leſs reſiſted, or the difficulty of retention augmented.

3. The unfavourable external form of the part affected. The more this deviates from the cylindrical, and approaches to the conical ſhape, our applications have a more unfavourable hold of the included parts. The form of the thigh is a ſtrong inſtance of this obſervation, particularly if the patient is muſcular and plump.

4. The reſtleſſneſs of patients. It is needleſs to obſerve, after what has been ſaid, how abſolutely neceſſary to obtain a complete cure preſerving the limb ſteadily in one ſituation muſt be; or how eaſily, eſpecially in oblique fractures, by the ſmalleſt motion, the fragments may be deranged. If, from the thoughtleſſneſs of youth, our patients are fretful and unmanageable, they are ſurely excuſeable; but no apology is ſufficient for [the peeviſh diſcontent, and provoking inattention, of ſuch as are more advanced in life.

5. Accidents, ſuch as convulſive ſtartings, cough, and reaching to vomit. All theſe are very readily induced, in the more delicate or mobile ſyſtems, by the ſtimulus of the fragments; as they occaſion much concuſſion of the whole body, they muſt of neceſſity very often derange the fragments after coaptation. To this head belongs diarrhœa; the moleſting nature of which is obvious.

From theſe obſervations, the difficulty of retaining fractured bones in ſitu muſt be very evident. Indeed to effect retention properly has ever been regarded as a very important buſineſs;

and has accordingly, at all times, afforded abundant exerciſe to the invention of the ingenious practical Surgeon; as will hereafter appear.

Deligation of various kinds, and Poſture, comprehend the retentive means employed in fractures.

Deligation. This includes bandages of every kind, as well thoſe made of ſoft materials, ſuch as cloths of all ſorts, &c. as thoſe conſtructed of harder and more reſiſtant ſubſtances, viz. leather, wood, metal, &c. called Machines.

Before giving particular directions for performing deligation, it may not be improper, once for all, to intimate, that the intention of bandages is, in tranſverſe fractures, to protect the fragments from derangement by external cauſes, which alone can affect them; in oblique fractures, to reſiſt the deranging effects of both internal and external cauſes, as they are affected by either. The internal cauſe here chiefly alluded, is the contractility of the muſcles, to which the bones, in a ſound ſtate, oppoſe a reſiſtance, If, therefore, by bandages in oblique fractures, a temporary ſybſtitution to the now deficient reſiſtance of the bones is not afforded, they muſt either do miſchief or nothing.

From this view of the intention of bandages in the management of fractures, we muſt certainly conclude, that it can never be completed by ſuch alone as conſiſt altogether of ſoft and pliant materials. For this reaſon it is, that pieces of metal, wood, leather, paſteboard, or the like, under the name of ſplints, have always made an eſſential part of the moſt ſimple apparatus for the retention of fractured bones.

The roller-bandages, on account of the motion and diſturbance which the fragments muſt ſuffer from applying and removing them, are moſt improper and inconvenient in the cure of fractures, and are juſtly ſuperſeded by two or three circular ones, put once, or, at moſt twice, round the limb, or by bandages with eighteen or twelve tails, or others conſtructed on the ſame principle, ſuch as are deſcribed by Scultetus and Mr William Sharp; and as, by their means, the ſtate of the fracture can be conveniently and ſafely inſpected, they are peculiarly adapted to the cure of compound fractures, where the roller-bandages can have no place.

Some practitioners prefer theſe bandages when made of flannel to ſuch as are made of linen cloth, from an opinion that they can be applied with greater firmneſs and neatneſs; at the ſame time, in caſe of ſudden ſwelling intervening, they yield a little, and conſequently are not ſo apt as the linen ones to impede the circulation.

The ſplints moſt commonly employed are made of paſteboard. When gently moiſtened before application, they aſſume, to a conſiderable degree, the ſhape of the part over which they are applied; and thus very much favour and facilitate the retention of the fragments; which indeed is chiefly effected by the action of ſplints; the bandages may be conſidered as only ſubſervient.

Leather-ſplints are extolled by ſome as much ſuperior to the paſteboard ones; particularly in compound fractures, where the rigidity of the paſteboard is altogether deſtroyed by the matter diſcharged from the wounds, and by the moiſt applications that may be neceſſary. This is undoubtedly true; but in ſuch caſes any of them of the common form are much inadequate to the taſk.

Whether paſteboard, leather, or metal ſplints are employed, they ought to be long enough to reach the full length of the fractured bone, or from the joint above to the joint immediately below the place of the fracture. At the ſame time that theſe long ſplints very much contribute to ſecure the fragments againſt alteration, they preſs leſs than the ſhort ones commonly uſed, on the place of the fracture where the inflammation and pain are greateſt.

As to the requiſite number of ſplints, two of proper form and breadth are ſuffibient. They are to be lined with thick compreſſes of folded linen or flannel; ſtitching theſe to the ſplints greatly facilitates their application. On the back part of one of the ſplints, ought to be fixed, at proper diſtances, ſeveral ſtraps of ſtrong tape, of ſuch length as to be able to ſurround the limb, and tie over the oppoſite ſplint. Theſe become the circulars already mentioned.

Splints intended for the leg muſt have a hole or excavation in their lower extremities to receive the ancles; theſe contribute a good deal to render more effectual.

If ſplints thus conſtructed are properly applied, ſcarcely does any further bandaging ſeem neceſſary; for it is doubtful if by it the ſecurity againſt alteration of the fragments can be increaſed. If, however, any more ſhall ſtill be thought proper, the bandages mentioned above are undoubtedly preferable to thoſe of the roller-kind.

Poſture. It is a very material point, after having proceeded thus far, to contrive a method of repoſing the diſeaſed limb, that may equally quadrate with the curative intention and the patient's eaſe.

When treating of extenſion, it was obſerved, that a relaxed ſtate of the muſcles very much facilitated the reduction of the fragments; that poſture of the limb, therefore, in which the greateſt number of muſcles are relaxed, is here to be carefully conſulted; eſpecially if the patient is muſcular, and the fracture oblique, becauſe it equally favours retention.

If the fracture is aſcertained to be of the tranſverſe kind, after the coaptation is properly executed, I know no reaſon, of any force, why the relaxed ſtate of the muſcles ſhould be much regarded: on the contrary, perhaps, their being conſtantly on the ſtretch, by firmly oppoſing the ends of the fragments to one another, may not a little contribute to retention.

When the arm-bones are fractured, the relaxed ſtate of the muſcles is naturally and univerſally adopted. To ſay any thing farther on this part of our ſubject, is therefore altogether unneceſſary. When the bones of the lower extremities are fractured, it is much more difficult to obtain the relaxed ſtate of the muſcles. Mr Pot reſts the ſucceſsful cure of fractures, thoſe of the thigh-bone not excepted, almoſt totally on the obſervance of this circumſtance: he directs the patient to lie on the ſide which correſponds with the fractured limb; by which means the limb being laid on its ſide above a pillow, the knee-joint can be kept in a ſtate of flexion to the requiſite degree.

It may be objected to this poſture of the leg and body, that properly to obtain it is often impracticable. For this purpoſe, the matraſs-bed, on which the patient lies, ſhould be of an equal hardneſs in every part, that his body and leg may remain, during the whole cure, in the ſame plane: for if the body ſinks more than the leg, (which it always does when laid on beds conſtructed with the ordinary materials, ſuch as feathers or chaff), they ſoon came to be in very different planes; and thus there is danger of diſtorting what we meant to rectify. In hoſpitals, indeed, ſuch equally hard matraſs-beds may be purpoſely conſtructed; but in common practice the caſe is very different.

Admitting this difficulty, reſpecting the inequality of the bed, to be ſurmounted, it may ſtill be ſaid, that lying on the ſide becomes much ſooner irkſome than on the back; becauſe, in the former ſituation, the weight of the body is ſuſtained by a leſs and more unequal ſurface than in the latter. The arm alſo of the ſide on which the patient lies, is ſo much hampered and confined, as to prevent him from taking diet or medicine, though placed within his reach. That to patients labouring under fractures, a ſituation as little irkſome and inconvenient as poſſible ſhould be choſen, is highly expedient; when it is conſidered, how tedious the cures often are; and that the ſmalleſt alteration of poſture, for the ſake of eaſe, will often defeat all that has previouſly been done.

It may be here alledged, that the patient may reſt chiefly on his back, and keep his leg, notwithſtanding, on its ſide, in a ſtate of flexion. This obviates the objection as to the leg, ſtrictly ſo called; for undoubtedly the muſcles may attain to all the relaxation which poſture alone can yield, while the patient remains in a ſupine ſituation. This is, however, by no means the caſe with the thigh; for unleſs the patient really inclines very conſiderably to the ſide, the ſtrong muſculi adductores femoris will in ſome degree be kept on the ſtretch. When the fracture is in the neck of the thigh-bone, or near its trochanter major, how much this circumſtance muſt counteract the curative intention, it is eaſy to conceive. Wounds attending fractures ſituated on the external parts of the leg, altogether preclude the ſide-poſture, while the uſual plan of management is adopted.

Surgeons hitherto have been more employed in adapting their patients, by poſture, to the ordinary form of beds, than of altering and accommodating this form itſelf.

The relaxed ſtate of the muſcles of the thigh and leg can be obtained, while the patient lies freely on his back, by the following method; againſt which fewer objections ſeem to lie than againſt the other. I have known patients remain nine or ten weeks very ſteadily on their backs; but never any for half that time with ſuch conſtancy on their ſides.

In fractures of the thigh-bone, the patient's body is to be elevated a foot or eighteen inches above the general ſurface of the bed. The ſimpleſt method of effecting this, is to double up the proper matraſs of the bed, ſo as that the legs, from the knees downwards, may project over the doubled part of it, to allow of the flexion of the knee-joints. By placing the patient in this way in the day-time, the body, by means of a bed-chair, pillows, &c. may, without occaſioning the ſmalleſt diſturbance to the fragments, (unleſs the fracture is in the neck, or very near the upper part of the bone), be raiſed to the fitting poſture. How ſoothing this alteration muſt be, and how much it will diminiſh the irkſomeneſs of long confinement, is eaſier to be conceived than expreſſed.

When the fracture is ſituated below the knee, the leg, from the knee downward, is to be raiſed and kept in a plane fourteen or fifteen inches higher than the ſurface of the bed, that the knee-joint may admit of ſuch a degree of flexion as is ſufficient for relaxing the muſcles. The height of the one plane above the other, both for the thigh and leg, muſt be varied according to the ſize of the patient. This elevation of the leg can be eaſily effected, by placing pillows above one another, or by any other contrivance which time and place may ſuggeſt. By this method alſo the patient may be regaled with the ſame alternation of poſture propoſed above.

If the dependent ſituation of the leg, when the thigh is placed as deſcribed, ſhould be found to induce ſwelling, or to increaſe it, it may be raiſed nearer to the level of the body, without much diſadvantage; for a conſiderable variation of the angle of flexion has but little influence in ſtretching or relaxing the femoral muſcles.

The only circumſtance that can render the poſition of the thigh and leg above mentioned impracticable, is the accident of wounds in their back-part: in this caſe, the other method muſt be adopted. By means of a flat baſon and urinal, the fœces and urine can be received with abundant convenience, whether the patient be placed in the one or other of theſe ways.

OF FRACTURES IN THE THIGH-BONE.

THE difficulty of conducting the cure of fractures of the thigh-bone is known and confeſſed by all. The genius and invention of the beſt Surgeons have been much exerciſed to deviſe a method of treatment by which this might be obviated. However, as the number of fractures of this bone is almoſt equalled by that of conſequent deformities, ſuch as ſhort and decayed legs, &c. the proof that their labours have hitherto been much unſucceſsful is but too plain.

Thickneſs and ſtrength of the ſurrounding muſcles, together with the conical ſhape ſo peculiar to the thigh, principally create the difficulty of retention, which always occurs in fractures of this bone. When with theſe are conjoined obliquity of fracture, and the accidents ſo often defeating our retentive applications before mentioned, the taſk becomes more and more arduous.

Fractures in the neck of this bone, which, on account of its obliquity and ſpongy texture, happen much oftener than was formerly imagined, are, from its natural ſituation, always oblique, with reſpect to the common axis of the bone, and the direction of the femoral muſcles. This circumſtance renders the retention of fractures here more difficult than in any other part of this bone.

The grand deſideratum is, by ſome means or other, to create a temporary ſubſtitution to the now-deficient oppoſition which was afforded by the bone to the contractility of the femoral muſcles, as well as to prevent derangement of the fragments from any accidental motion of the leg or body. Any apparatus or mode of deligation for a fractured thigh-bone, incapable of compleating theſe intentions, is evidently very much defective.

This ſubſtitution to the deficient reſiſtance of the bones can only be made by aſſuming two fixed ed points, the one above and the other below the place of the fracture, which are to be maintained at the ſame diſtance from one another which they held after coaptation, till the reuniting callus is ſufficiently confirmed.

Upon this principle we reject the ſpica-bandage, junks, and the like, as altogether unequal to retain the fragments in the ſituation in which they were placed by coaptation. The patient would undoubtedly be leſs tormented, and the deformity would not probably be greater, were the caſe after coaptation entirely committed to nature, and no trial made towards a cure by ſuch inadequate and prepoſterous means as the common practice employs.

The method of placing the fractured thigh on its ſide, as directed by Mr Pot, and truſting the retention altogether to this poſture, I am much inclined to regard as doing little more than leaving it to nature. In oblique fractures eſpecially, the contractility of the ſtrong and numerous femoral muſcles forbids us to expect retention from poſture alone, however well contrived. Indeed ſplints ſecured with the ordinary bandages are not neglected: however, for the reaſons adduced, the additional ſecurity reſulting from theſe is very inconſiderable. Keeping the muſcles, as much as may be, relaxed, by the method already recommended, no doubt contributes conſiderably towards retention, by ſomewhat ſhortening the line of their contractility, and rendering them leſs apt to pull the fragments over one another than when the leg is fully extended in the ſame plane with the body; yet ſuch long muſcles are ſtill capable of contracting much more; and always do ſo as ſoon as the fragments loſe their oppoſition; and the reſiſtance to their further contraction is thereby in a great meaſure removed.

From theſe obſervations it follows, that if retention of the fragments of the os femoris is at all to be effected, it muſt be by ſome rigid ſplint or machine, aſſiſted by poſture, calculated to fulfil the purpoſes above enumerated, with as great ſafety to the parts, and eaſe to the patient, as poſſible.

Such ſplints or machines only are here underſtood as are conſiſtent with the relaxed ſtate of the muſcles, whether to obtain it the patient lie on his ſide or on his back; therefore the above concluſion by no means contradicts what Mr Pot ſays in the following paſſage; where, apprehending that ſuch aſſiſtances were inconſiſtent with keeping the muſcles relaxed, and reſolving to confide in poſture only for a perfect cure, his words are: "If I meant to deſcribe, or if I approved, "(pardon the phraſe), the common method of "placing the broken leg and thigh in a ſtraight "manner, this would be the place to mention "the many very ingenious contrivances, and pieces of machinery, which practitioners, both "ancient and modern, have deſcribed, for the "purpoſe of keeping the whole limb ſtraight "and ſteady; that is, of keeping all the muſcles ſurrounding the fractured bone upon the "ſtretch, and at the ſame time of preventing "any inequality in the union of it, and any ſhortening in conſequence of that inequality; but "as my intention is to inculcate another, and, as "it appears to me, a better diſpoſition of the "limb, in which ſuch boxes, cradles, and pieces of machinery, are not wanted, or cannot "be uſed, it is needleſs to ſay any thing about "them."

I ſhall take the liberty to make a few remarks on ſome of the machines which have been recommended to accompliſh retention of the fractured os femoris.

The caſe of a young girl, who, by a fall from a houſe-top, had fractured her thigh-bone, is narrated by the celebrated F. Hildanus. The fracture was near the upper part of this bone, the leg was conſiderably ſhortened; and, from the over-lopping of the fragments, a large tumor was perceived at the place of the fracture. Extenſion, coaptation, and delegation were performed; and, for fourteen days, every thing ſucceeded to his wiſh. In the night-time, ſoon afterwards, however, ſhe had altered the ſituation of her body, by which the fragments were diſplaced; ſo that, on viſiting her in the morning, he found her leg ſhortened, and the tumor returned. Extenſion, &c. were repeated, and the ſame accident followed: he now deſpaired of ſucceſs, and thought it vain to make any further attempts towards a perfect cure.

When in this predicament, he happily contrived a machine; the invention of which (with more devotion than falls, I am afraid, to the lot of many of his modern brethren) he piouſly aſcribes to the inſpiring aid of Heaven. By it he effected perfect retention and cure.

This machine conſiſts of an iron plate, of ſufficient length to reach from the top of the pelvis to below the knee; properly hollowed, to receive the external part of the thigh; and lined with ſoft materials. It is provided with three belts; one is fixed round the pelvis; the other two round the leg, the one immediately above, the other below the knee.

Though this machine, to retain the fractured thigh-bone, is deficient in ſome neceſſary qualities, and ſeems chiefly to act by preſſure on the place of the fracture, and that during the extended poſture of the leg; yet it is by far more likely to effect the retention of the fragments of this bone, than the bandaging commonly employed, particularly than junks. It is ſurpriſing it has not been oftener made uſe of. By omitting to tie the belt, which paſſes below the knee, it permits flexion of the knee, with a view to relax the muſcles, in whichever of the two poſitions above mentioned

tioned the leg is placed. This is an advantage not attended to by its author.

The following paſſage from Dr James's Medical Dictionary is not foreign to our ſubject. After remarking the difficulty of retaining the fragments of this bone in ſitu, he ſays, "It would be "worth while to invent a machine to preſerve a "fractured thigh in due extenſion, ſo that the in- "jured limb may be kept of the ſame length "with the other, for fourteen days or more, or "indeed during the whole time of the cure; for "then you might reaſonably expect a certain and "more ſuccefsful conglutination. Though Hilda- "nus has deſcribed an inſtrument proper for the "extenſion of oblique fractures; yet it is to be "feared it is ſomething imperfect. In the mean "time, ſince we are without a better, and the "method by bandage is not thought ſufficient, "it will not be amiſs to apply that machine of "Hildanus," &c.

The next I ſhall mention is one invented by M. Belloq, a very ingenious Member of the Royal Academy of Surgery in France, approven of by that learned and reſpectable body; and which M.

Belloq found to ſucceed in two caſes of oblique fracture of the os femoris, after he had in vain tried the bandaging apparatus commonly employed in ſuch caſes.

M. Belloq calls it a Mechanical bandage. It can only be applied when the leg is in an extended poſture; therefore, according to our principles, it cannot be here recommended. Independent of this objection, its very complex, though artful conſtruction, will, we are afraid, prevent it from ever being adopted by the general practice.

The very ingenious Mr Gooch, an eminent Surgeon in Norwich, has invented and recommended a machine, expreſsly calculated to perform retention of the fragments of the os femoris. It conſiſts of three jointed circulars, lined with ſoft materials to ſurround the limb. The upper one applies to the upper part of the thigh; the other two are connected together; the one fixes above the knee, the other below it, the better to divide the preſſure: they are therefore only to be regarded as one. This and the upper one are connected by two pillars, one on each ſide of the thigh, ſo contrived, that by turning ſcrews they are elongated at pleaſure; and the two circulars are farther removed from one another: and thus the intervening portion of the thigh in which the fracture is ſuppoſed to be, is kept extended to its natural length, and a ſubſtitution provided againſt the action of the muſcles, in place of that which the bone in a ſound ſtate afforded. His own account of it is as follows:

"How to keep a fractured thigh duly extend-
"ed, particularly in adults, has exerciſed the
"thoughts of ſome of the ableſt Surgeons; and
"it is a point of great conſequence to be well ef-
"fected.

"Several years ago, I had a machine made for
"this purpoſe, according to a ſketch I drew of it
"before; and ſoon had a fair opportunity of trying
"its uſefulneſs. It anſwered my deſign the firſt
"time I uſed it beyond my expectation, in a ve-
"ry bad oblique fracture, attended with a vexa-
"tious cough, which occaſioned extreme pain by
"ſhaking the limb, and deprived the patient of
"his reſt: it kept the part, ſenſibly to himſelf,
"in a gentle extenſion, and the limb in a ſteady
"poſture,

" poſture, ſo that it was not the leaſt affected by " the cough afterwards; which before, according to his own expreſſion, gave him ſuch a ſenſation of pain, as if the ends of the bones were " thruſting into the fleſh. This machine being " lined with ſoft oiled leather, and well ſtuffed " with wool, ſat very eaſy on the part, without " cauſing any excoriation. Pieces of buff-leather " will defend the limb againſt the machine, as " well as the other lining and ſtuffing, as has been " particularly tried; but very particular caution is neceſſary, to guard the inſide of the " thigh.

" This machine is very ſimple in its conſtruction, and intended to maintain its power upon the limb in any poſture neceſſary to put it " or the body in; and I hope the repeated trials " of other Surgeons will farther confirm its utility, even in fractures upon the neck of the " bone."

An objection to this machine is, that it cannot ſafely be brought to act with force ſufficient to reſiſt the contraction of the muſcles, becauſe of its upper circular, which being entirely fixed on the

oſt

ſoft muſcular parts of the thigh, not only the circulation of the limb in general, but that in the great veſſels which run on the inſide of the thigh in particular, is in danger of being much impeded; and ſo ſwelling, inflammation, and perhaps gangrene of the whole leg, induced, unleſs provided againſt with the greateſt circumſpection. The author himſelf indeed acknowledges, that "great caution is neceſſary to guard the inſide of "the thigh."

Though the upper circular thus embracing the thigh in its upper or middle part, where the circulation is altogether unprotected againſt its action, creates an objection to this machine, this cannot be ſaid of its lower one, which is prevented from ſenſibly impeding the circulation, by the ham-ſtrings, or tendons of the flexor muſcles of the leg, between which the crural veſſels paſs ſecurely. The two circulars connected inflexibly together, however, render the flexion of the knee-joint, and conſequently the relaxing of the muſcles, impoſſible.

When the neck of this bone is fractured, the trochanter major is drawn upward on the lateral and back part of the pelvis, conſiderably above the acetabulum, by the contracting muſcles. To this circumſtance the ſhortening of the leg, always conſequent to fractures here, is owing. As Mr Gooch's machine does not lay hold of the pelvis, but of the thigh itſelf, it is to be feared, that in this caſe it would not properly effect retention, although it could otherwiſe be uſed with the greateſt ſafety.

Having thus (with the ſame candour with which I wiſh my own propoſals may be tried) examined the ſeveral contrivances for accompliſhing retention of the fractured thigh-bone, which bade faireſt for ſucceſs, and found them inadequate, inconvenient, or unſafe, with deference, I next proceed to propoſe and deſcribe other machines for performing this important buſineſs, againſt which none of the objections produced above, or any others of equal weight, as far as experience or information have yet ſhewn, can fairly be made; which I fondly hope the candid experience of my ingenious brethren will farther improve and confirm.

It has already been obſerved, that a proper and neceſſary reſiſtance to the conſtant contractile niſus of the femoral muſcles, now that the bone is fractured, can only be ſupplied by aſſuming two fixed points, the one above and the other below the fractured part; which are to be maintained at the ſame diſtance they held naturally, or immediately after extenſion and coaptation were duly accompliſhed.

The pelvis offers itſelf as the moſt proper part on which to aſſume the ſuperior fixed point; becauſe here the circulation and internal organs are protected from any preſſure that may be conſequent upon doing ſo. Its ſituation alſo, as being above the neck of the thigh-bone, is an additional recommendation. The lower part of the thigh, or ordinary gartering place, for reaſons already alledged, is to be choſen for the inferior on. About each of theſe a belt or circular is applied.

The circular which embraces the pelvis occupies the ſame place where the top-band of the breeches in men is fixed, and with much the ſame ſtrictneſs, and reſembles it pretty much in ſhape; the other circular applies above the knee, with about the ſame tightneſs which the garters commonly have. Theſe conſtitute the two fixed points, and are the baſis of the reſiſtance to the muſcular contraction which we mean to produce; their particular ſtructure and application ſhall be taught hereafter.

Graduating ſteel-ſplints, three or more in number, connect theſe circulars in ſuch a manner, that the intercepted portion of the thigh can be kept more or leſs extended at pleaſure, with abundant ſteadineſs and ſafety; and that even in ſpite of the motion which may be occaſioned by convulſive ſtartings, coughing, reaching to vomit, &c. for any length of time, and with equal facility and ſucceſs, whether, to obtain the relaxed ſtate of the muſcles, the patient lie on his ſide or back; and, which is of the laſt importance, this mode of dreſſing a broken thigh-bone, cauſes as little pain or uneaſineſs, as well when applying as afterwards, as any other apparatus whatever, that is likely to be productive of the ſmalleſt advantage. While all this is accompliſhed, the circulation is in no degree obſtructed; as any one, ever ſo little acquainted with the anatomy of the parts concerned, muſt know.

Previouſly to any further explanation of what I am inclined to regard as peculiar advantages reſulting from the uſe of this machine for retaining the fractured thigh-bone, it may not be improper to give ſuch a particular deſcription of its parts, and mode of application, as may enable ſuch as chuſe properly to conſtruct and apply it.

The largeſt circular, or that which ſurrounds the pelvis AAA, (Plate I. Fig. 1.), conſiſts of a piece of thickiſh ſaddle-leather; its breadth, when intended for an adult, may be from three to four inches: in one end of it are three or four ſtuds, which have as many correſponding holes in the other end, by which it is buttoned or faſtened round the body. Theſe holes are continued backward, one after another, at ſmall diſtances. By this ſimple artifice, its circle can be augmented or diminiſhed, ſo as to accommodate itſelf to pelves of different ſizes, or with different degrees of ſtrictneſs to the ſame pelvis.

This leather circular, all except its perforated part, and about a quarter of an inch on each edge, is covered on the inſide with a flexible thin iron-plate, ſuch as is ſometimes uſed by tin-plate-workers. It has two obſcure joints in that part which anſwers to the back; theſe allow it to open and eceive the body with the greateſt eaſe.

Over this iron-plate, the circular is lined with the ſofteſt buff or ſhamoy leather; between which and the plate a thin layer of hair or wool is interpoſed. The lining ought to project on both ſides over the leather half an inch, or more, to prevent it in any degree from preſſing on the ſkin. The lining is ſtitched all round to the edges of the leather, to which the iron-plate does not extend.

It is moſt convenient to throw the opening of this circular to one ſide of the os pubis. After it is applied, to prevent it from moving upwards, (which the ſhape of the pelvis, and the preſſure made from below, hinder from happening downwards), two thick ſtuffed ſtraps BB, fixed to its back part, paſs between the thighs from behind, to tie, by means or their forked ends, to its fore-part. As almoſt the whole reſiſtance to the ſhortening of the thigh falls ultimately on theſe ſtraps, it is of conſequence that they be thick and well made: if they ſhould, notwithſtanding, at any time, be found to ſit uneaſily, a ſoft-folded cloth, or the like, can be put betwixt them and the ſkin.

From the above deſcription, it will now be evident, that this whole circular is conſtructed on the very ſame principle, applied and ſecured to the very ſame places, and in the very ſame manner, as the common ſpring rupture-bandage. The firſt idea of it, indeed, was ſuggeſted by obſerving with what eaſe and immoveable firmneſs a young man I had under my care for an hernia inteſtinalis wore one, during great exerciſe, and for a great length of time. The chief difference between the two is, that the circular is much broader and thinner, and tied down to the pelvis by two thick ſtraps in place of one, that it might leſs incommode the patient while lying on his back, and the better divide and reſiſt the preſſure from below, and act as a fixed point, without proving irkſome. It applies equally well, whether the body is naked or covered with ſhirt, waiſtcoat, breeches, &c.

The ſmall circular DD, or inferior fixed point, is exactly ſimilar to the large one in ſtructure, the tin-plate excepted, which, on account of its ſmaller diameter, was found to be unneceſſary. As was ſaid before, it applies round the inferior part of the thigh, or gartering place, with the ſame or ſomewhat leſs ſtraitneſs, than that with which the garters are commonly worn. It muſt not, however, be ſo ſlack as to get over the rotula and knee-joint. Some folds of ſoft flannel are, previouſly to the application of this circular, put round the part which it ſurrounds.

By means of three or more graduating ſteel-ſplints CCC, paſſing between theſe two fixed points, thus eſtabliſhed, to preſerve them at the requiſite diſtance from one another, the advantages derived from extenſion and coaptation are fully maintained, or perfect retention of the fragments is effected.

Theſe ſplints muſt be ſufficiently long to extend from the upper circular to the lower one, and to project over it about a hand-breadth. They anſwer very well, when made about four or five eighth parts of an inch broad, and about one eighth-part of an inch thick; that they may be rigid enough to reſiſt any violence tending to ſhorten or otherwiſe derange the limb and fragments; and at the ſame time ſo flexible, that they may be readily bended with the hand, and made to aſſume any degree of curvature in any part of them which may be found neceſſary.

Each ſplint has a hole or ſlit in its upper end, about half an inch long, and one eighth of an inch in breadth, to receive the flat head of a ſtud planted in the upper circular, in ſuch a manner as to allow of motion round it axis, for fixing the ſplint.

The inferior end of the ſplint paſſes through an iron ſcrew-plate, which is firmly riveted to the lower circular. The ſcrew has a flat broad head, that it may be eaſily turned with the fingers; and its point fitted to catch in ſome one or other of the impreſſions purpoſely made in the ſplint at ſmall intervals. It is eaſy to perceive, that by this means the diſtance between the circulars can be regulated at pleaſure, and, when determined, firmly maintained.

It will now be alſo very apparent, that by making ſeveral ſuch graduating ſplints to paſs from the one circular to the other, at proper diſtances, we form, as it were, a breeches-thigh, rigid enough to oppoſe unſurmountable reſiſtance to the muſcular contraction, or any ordinary accident tending to alter the coaptation of the fragments; which, notwithſtanding, is at the ſame time dilatable at pleaſure, in every dimenſion.

As to the requiſite number of ſplints, I have from experience found three anſwer very well. One paſſes from the upper circular oppoſite to the os pubis, to the inferior circular at the internal and back part of the thigh, immediately above the knee; another from oppoſite to the anterior ſpine of the os ileum, to the fore-part of the inferior circular immediately above the rotula; a third from above, and a little back from the acetabulum, to the external and back-part of the thigh, immediately above the knee. If more of theſe ſplints ſhould be found to be neceſſary, they can be occaſionally added in the intermediate ſpaces.

From the above deſcription, where, I hope, I have expreſſed myſelf intelligibly, it will be evident with what ſecurity and facility this machine may be employed, to effect retention of either thigh, or of both at the ſame time.

When this machine is properly applied, all motion of the thigh on the pelvis is totally ſuppreſſed; which will be found to be a circumſtance highly favouring retention; more eſpecially if the fracture is in or near the neck of the os femoris.

As this method of retention is effectual, independent of the aſſiſtance of any other bandaging whatever; by making the ſplints to arch properly outwards, the neceſſary applications to all the thigh, or to wounds in any part of it, may be made, without in the leaſt diſturbing the fragments, or paining the patient. Its extenſive uſe in the treatment of compound fractures of this part, requires no farther illuſtration.

Plate I.

Fig. 1.

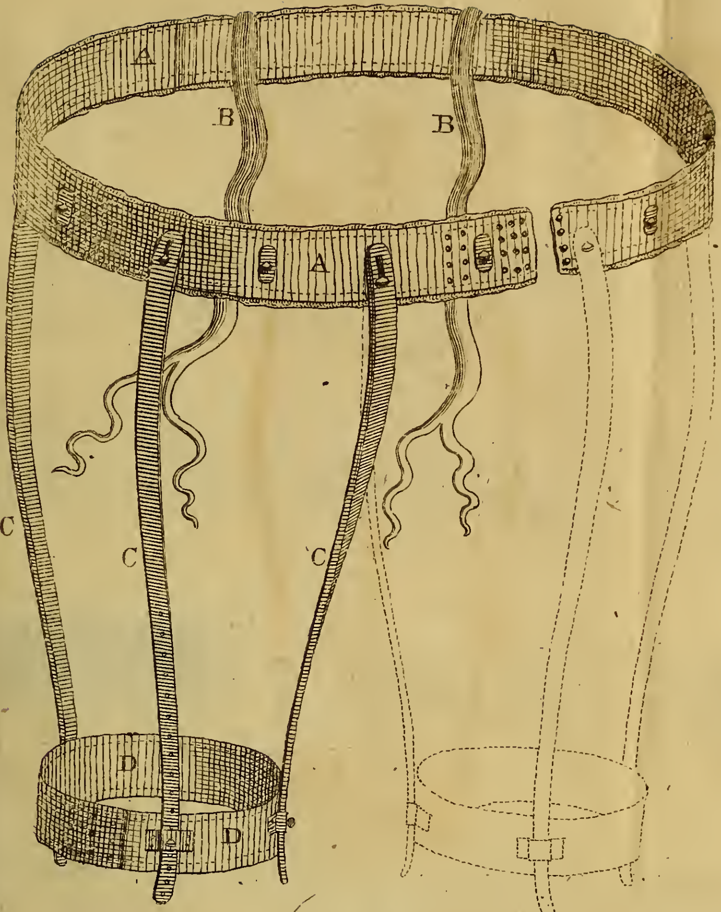


Fig. 2.

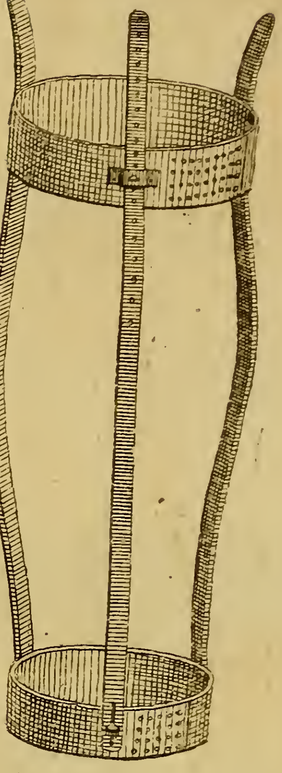


Fig. 3.

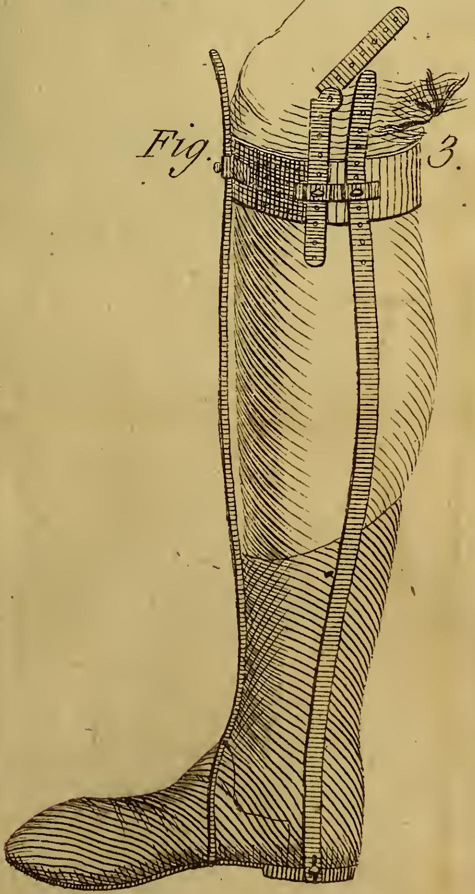
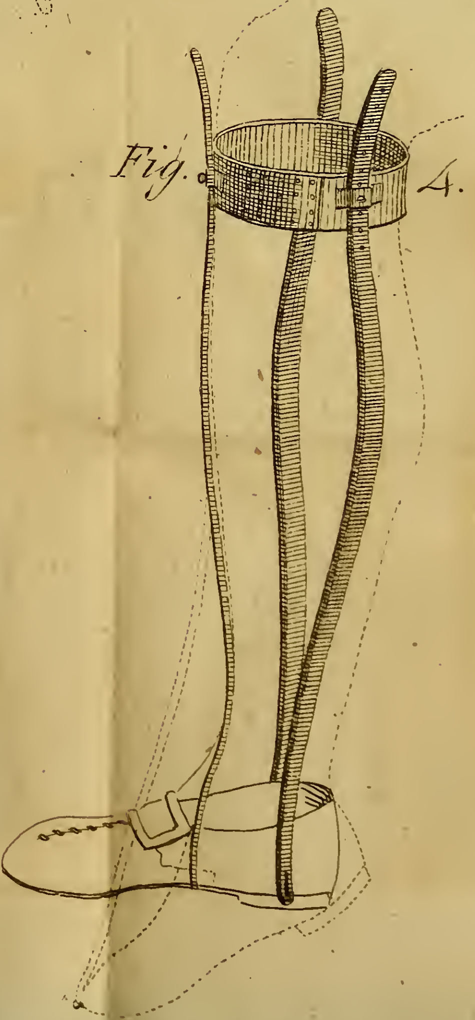


Fig. 4.



The advantages that may reſult from the uſe of this machine in the management of wounds of the thigh, with loſs of ſubſtance of the bone, (which may happen from various cauſes, particularly the different ſpecies of caries), will alſo be abundantly obvious. However, more fully to illuſtrate this obſervation, the following caſe is adduced, in which, if I am not much deceived, the patient would at leaſt have reaped much eaſe and relief from this apparatus.

" A ſtudent, at the age of twenty, for ſeveral years had an ulcer with caries in the middle and internal part of his thigh, where the crural artery deſcends. The caries, from the thickneſs of the fleſh in this part of the thigh, was inviſible; neither could the ulcer be enlarged with the knife, or the bone cauteriſed, on account of the vicinity of the great artery; ſo that all the medicines that were applied proved ineffectual. At length, in walking, without any external violence, the thigh was broken in this very part. Here, again, we could neither enlarge the wound, or cauteriſe the bone, for the reaſons above mentioned; and although the bone was reduced, and a proper bandage applied, yet it would never heal, and the patient led a miſerable life. It is therefore the duty of every one to conſider how ſuch a fracture ſhould be treated," &c.

While ſpeaking of the advantages of this machine, it may be mentioned, that by its uſe the ordinary time of confining the patient to bed may be much abridged; for, with it applied, he may much ſooner venture to riſe than would otherwiſe be prudent.

Another machine (Plate II. Fig. 1. & 2.) deſerves to be deſcribed. The principal part of it, (Fig. 1.), formed of tin-plate or thin copper, is ſo excavated, that it applies to the outſide of the fractured thigh, to which it ſhould be accommodated in ſize, &c. as nearly as poſſible. It may be lined or ſpread over with any ſoft material, ſuch as flannel, tow, or wool. It muſt be of ſufficient length to reach from the the ſpine of the os ileum to below the knee. The inferior extremity of it is accordingly adopted to the knee in a ſtate of ſemiflexion: A circumſtance which contributes much to the retention.

This part being juſtly applied, the other piece, (Fig. 2.),

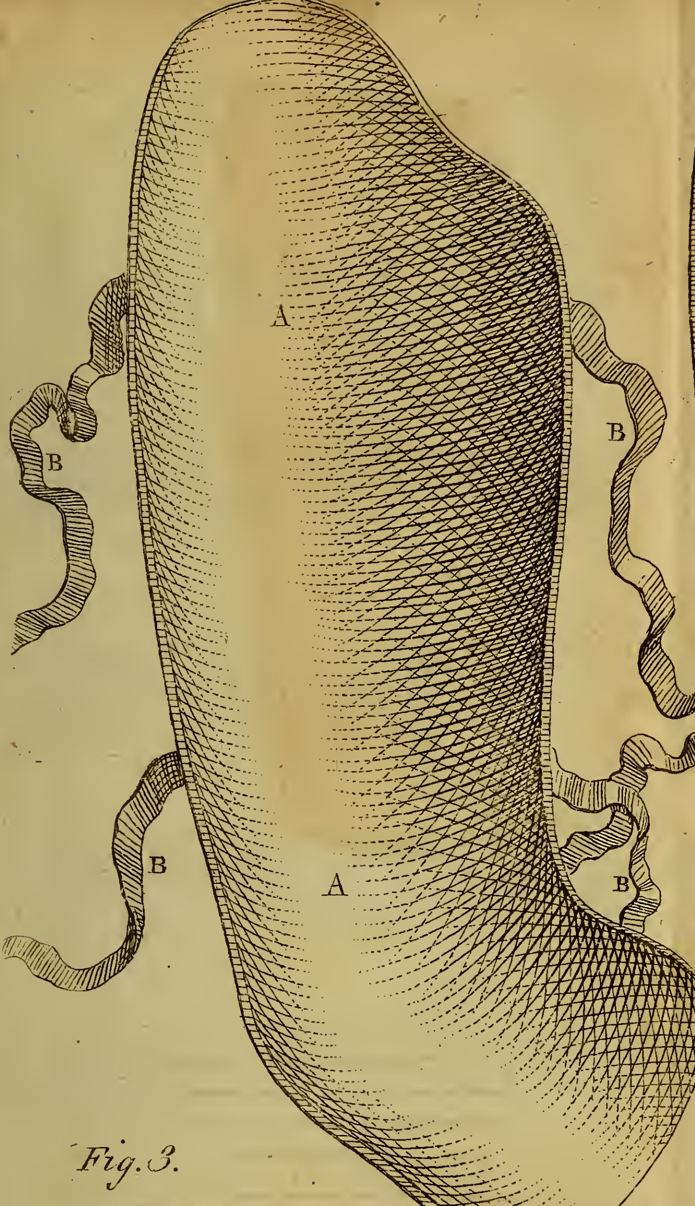


Fig. 2.

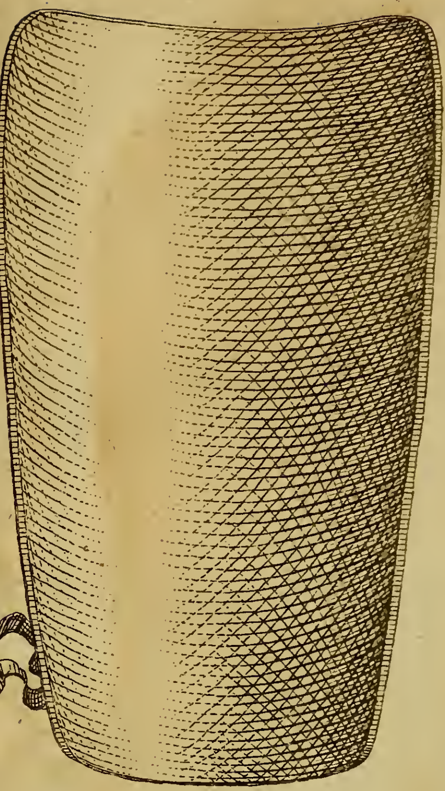


Fig. 6.

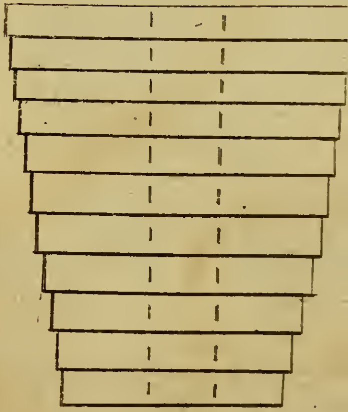


Fig. 3.

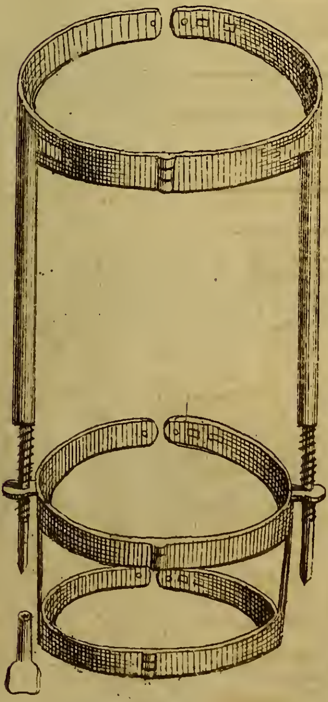


Fig. 4.

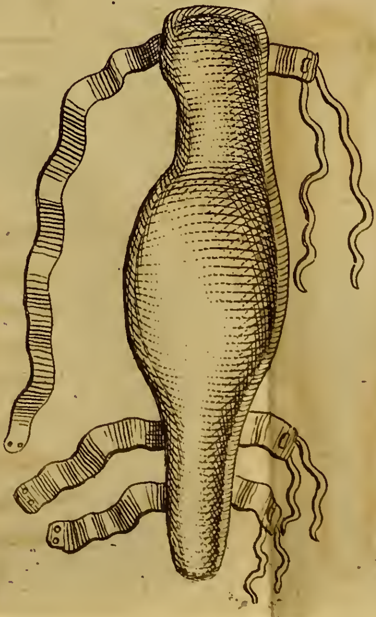


Fig. 5.

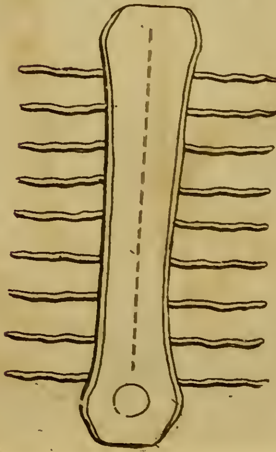


Plate II

Fig. 1.

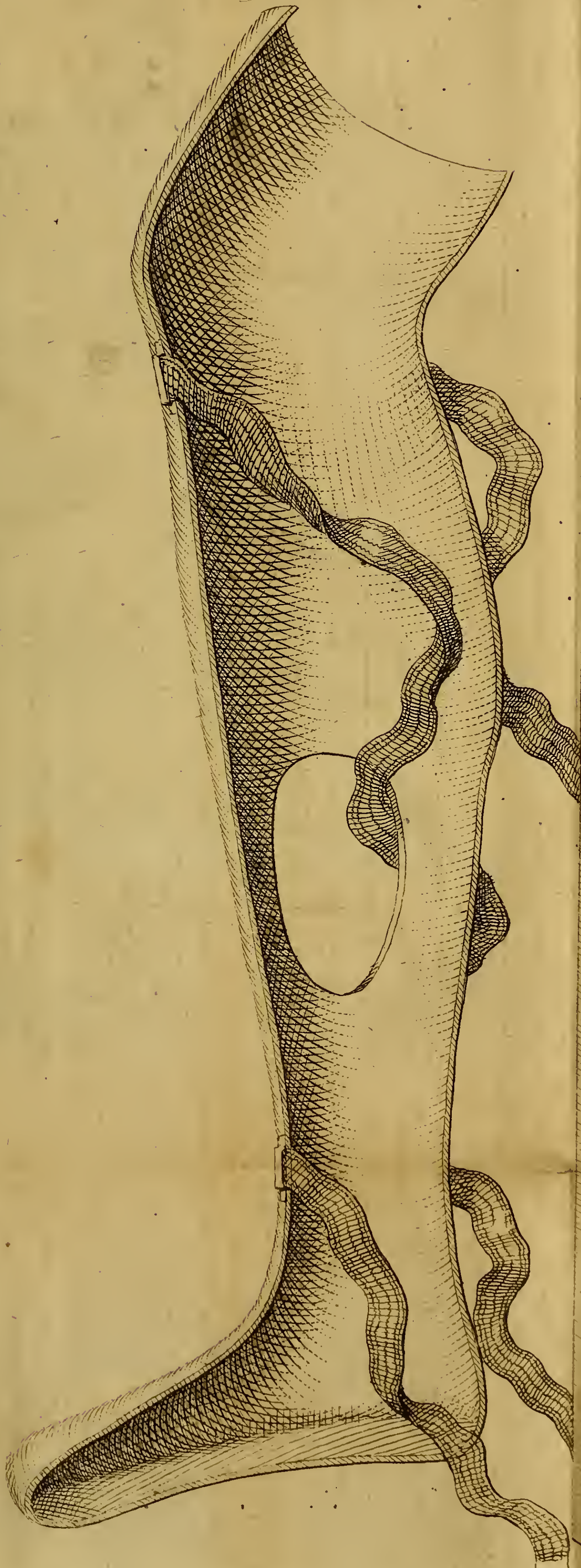
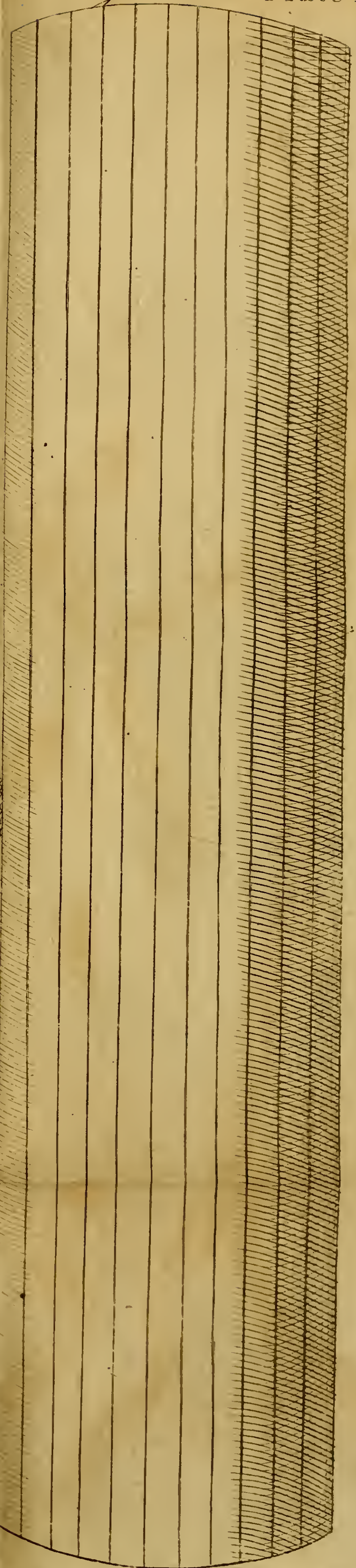


Fig. 2.



(Fig. 2.), lined properly like the other, is fitted on the oppoſite part of the thigh; its upper end reaching to the groin, and the inferior one of it, as repreſented, may extend to the knee; or it may be longer, and adapted to the knee in a ſtate of ſemiflexion. By means of the belts, or ſtrong tapes BBBB, the two pieces are firmly bound together, ſo as to give a uniform compreſſion, which greatly favours retention.

If this machine ſhould be found to be leſs retentive than the other, it compenſates for this deficiency by its ſimple ſtructure, which is a great recommendation in favour of any apparatus.

Both theſe machines apply equally to the ſimple and compound fractures of the thigh-bone.

OF FRACTURES IN THE LEG-BONE.

THE difficulty of effecting due retention of the fragments of the leg-bones, after coaptation, is far from being ſo great as that of the fractured thigh-bone is ſhewn to be. However, if fractures here are much oblique, attended with wounds, or followed with high inflammation, ſuppuration, &c. the retentive part of their treatment is by no means eaſy to be accompliſhed. Any conſiderable loſs of the ſubſtance of the bones ſtill renders this buſineſs more difficult. Of this laſt aſſertion the following caſe will furniſh an illuſtration.

A man, who by a fall from a great height had received a very bad compound fracture of the leg, with the tibia conſiderably protruded from the wound, was put under the care of M. Vernier, an able Surgeon. After coaptation, he found it impoſſible, by the ordinary bandages, to effect retention of the fragments; and gangrenous ſymptoms ſupervened in conſequence. After theſe were mitigated by proper remedies, M. Vernier again attempted extenſion; but, on account of the remaining ſwelling, this, in a due degree, was found impracticable.

On the twentieth day from the accident, the aſſiſtance of M. Coutavos, of the French Academy of Surgery, (by whom this caſe is publiſhed among the Academy's memoirs), was obtained. Upon careful examination, M. Coutavos found a portion of the tibia, above five inches in length, almoſt quite detached. With the neceſſary precautions, this was extracted; the fragments of the fibula were obſerved to paſs one another above four inches; the leg was ſhortened in the ſame degree; notwithſtanding the uſe of a machine invented and recommended for the retention of fractures, by M. la Faye; which will be hereafter mentioned.

In this ſituation, the patient ſuffered ſuch intolerable pain from the ſtimulus of the pointed fragments, that M. Coutavos found it abſolutely neceſſary to procure extenſion of the leg, by ſome means or other; which he accordingly attempted, in the following laborious manner.

Lacs, properly made, and paſſed under the patient's arms, between the thighs, and below the knee of the fractured leg, were fixed to the head of the bed-frame, with a view to ſecure his body from yielding to the extending power; which was applied by means of another lac paſſed round the ancle, which could be ſtretched at pleaſure, by an axis in peritrochio planted at the bed-foot. By gradually increaſing the extenſion in this manner, the limb at laſt regained its natural length.

After the patient had remained in this racking ſituation for fifteen days, M. Coutavos ingenuouſly confeſſes, that, by the ſtrictneſs of the lac at the ancle, ſo great ſwelling of the foot enſued, as made it abſolutely neceſſary to diminiſh the extending force; in conſequence of which, the leg was again ſhortened above an inch.

Both by experience and probability, I am encouraged to propoſe a machine, (Plate II. Fig. 3. & 4.), conſtructed on the very ſame principle with the one recommended above for the thigh; which bids fair to effect retention of the fractured leg-bones with the greateſt poſſible eaſe and ſafety, where-ever this is by any means practicable.

In this machine, the graduating ſplints, made rather longer than the leg from the knee downwards, to which they are to be applied, are connected at their lower extremities, by means of flat-headed vertible ſtuds or pins, to the ſoal of a ſhoe laced before, otherwiſe of the ordinary form, (Fig. 4.); or with the quarter-heel protracted in the form of a half-boot, (Fig. 3.), the better to embrace and lace round the ancle and inferior part of the leg.

The other extremities of the ſplints are fixed in the ſcrew-plates of a circular, exactly ſimilar to the inferior circular of the thigh-machine before delineated, applied below the knee.

The fore ſplint is made forked, or with an opening at the lower extremity, (Fig. 3. & 4.), of a compaſs ſufficient to receive, but ſo as not in the ſmalleſt degree to preſs upon the fore-part of the foot. This circumſtance contributes greatly to the ſecurity of the foot againſt lateral motion.

The intention of the ſhoe's having a laced opening before, (in whichever of the two forms it may be made), (Fig. 4.), is, that the foot may be lodged in it, with as little pain to the patient, or diſturbance to the fragments, as poſſible. When this is done, the opening is to be accurately ſecured with the lace. The foot is previouſly to be involved in a piece of ſoft flannel, or covered with a ſtocking-foot, as well for the ſake of ſoftneſs as warmth. At firſt I made uſe of this machine conſtructed with a circular, which fixed about the leg at the ancle, (Fig. 2.); but from repeated trials have found the ſhoe to anſwer better in every reſpect.

It will readily be underſtood, from the deſcription of this machine, how effectually, by its means, the retention of all compound as well as of ſimple oblique fractures of the leg may be effected with the greateſt convenience and ſafety: By bending the ſplints a little outwards, it allows the wounds to be inſpected and dreſſed with the greateſt eaſe, in whatever part of the leg they may be ſituated; by laying hold of the fore-ſplint with one hand, the Surgeon can raiſe the leg, alter its ſituation when neceſſary, ſhift the dreſſings or bandages without the help of an aſſiſtant, and, what is of much greater conſequence, without giving the patient the ſmalleſt degree of additional pain. It ſeems to me highly probable, M. Coutavos would have aſſiſted his patient as much, or more, by this inſtrument, than the method he purſued.

I have frequently uſed with great ſucceſs, as well in the ſimple as compound fracture of the leg-ſplints or demi-boots repreſented in Plate III.

This, like thoſe for the thigh before deſcribed, may be made of tin-plate or thin copper; either of which, under the hammer, readily aſſumes the proper excavation the more accurately they are adapted to the fractured leg, they are the more retentive. Any vacuities between them and the ſurface of the leg may be filled with tow or wool, which prevent them from being irkſome, while, by rendering them more equally compreſſive, their retentive effect is encreaſed.

When two of theſe ſplints are properly applied, and ſecured by the belts, or tapes of ſufficient ſtrength, it is manifeſt they muſt produce abſolute retention; becauſe, by laying hold of the knee-joint and the foot, and detaining them at a ſpecific diſtance, it cannot be otherwiſe.

To enable the ſame ſplints to apply to legs of different ſizes, they may be formed and furniſhed with graduated ſplints, as repreſented in Plate IV.

I have found one of theſe ſplints duly retentive even of the compound fracture. To allow the matter diſcharged from the wound (which is often in great quantity) to drill off, holes of any ſhape or number may be formed in any part of it that may be deemed the moſt ſuitable. When it is neceſſary to turn or raiſe the leg, it will be neceſſary to apply two.

I ſhall only add, that when one, at any rate when two are applied, the retention may be entirely effected, without the aſſiſtance of any bandage; for the knee-joint, the leg and foot are completely encaſed, and relative motion entirely prevented.

It does not appear to me to be poſſible to deviſe a more ſimple plan of retention, unleſs, as many Surgeons do, I think from indolence, we lay the limb on a pillow, with the ordinary bandages; which is in fact abandoning the chirurgic cure altogether, and literally leaving the caſe to Nature; which practice is nineteen times in twenty followed with deformity and diſability, more or leſs conſiderable.

In all ſimple and compound fractures, theſe inſtruments ſuperſede the neceſſity of any other bandage, ſoal-piece, ſafe-guard, fracture-box, &c.

recommended to protect the limb from being incommoded by the preſſure of the incumbent bed-cloaths.

Another advantage attending the uſe of theſe machines, not to be paſſed over in ſilence, is, that by their help the patient is in a condition to leave his bed with ſafety much ſooner than could otherwiſe be attempted. I had a young man, after a compound fracture of the leg, marching through the ſtreet with one of them, within four or five weeks from the accident.

Of transporting Patients with Fractures of the Bones of their Thighs or Legs.

A Consideration of the exquiſite tortures which theſe unhappy people muſt ſuffer, who are obliged, by unavoidable neceſſity, to be tranſported, ſometimes in great haſte, and to a great diſtance, with fractures of their thighs and legs, either quite recent, or before their fragments are re-united, in a very particular manner claims the joint ſuccours of humanity and art.

The gallant warrior, whether acting by ſea or land, is peculiarly expoſed to calamities of this kind. M. la Faye, an eminent Surgeon, and

Member of the French Academy, who, it would appear, has been an eye-witneſs of the diſtreſsful ſcenes which this circumſtance occaſions, can beſt paint them. I ſhall therefore, without farther apology, tranſlate part of a Memoir written by him expreſsly on this ſubject.

" Of all men who ſtand in need of the aids of Surgery, none deſerve it more than thoſe who continually expoſe their lives in defence of the State.

" No ſpectacle can be more affecting, than the tranſportation of a number of wounded officers and ſoldiers from the trench or field of battle to a place for dreſſing them. I have always, in ſuch conjunctures, been much touched with the exquiſite agonies cauſed by the motion of the perſons employed to place the wounded in proper carriages, and of the carriages themſelves, occaſion to ſuch as have the bones of their legs or thighs ſhattered.

" It is difficult to move, and place in a carriage, people in this ſituation, without diſturbing the wounded parts; but although this ſhould be accompliſhed, it is impoſſible that they can be driven for ſome leagues, or even half a league, without ſuffering the moſt acute pains from the ſhocks, which, in ſpite of all the bandaging about the fractures, at every movement, muſt diſplace the fragments, and make them grate on one another; thus irritating parts extremely ſenſible and delicate. If the pains occaſioned by the tranſporting are lively, the conſequences are not leſs troubleſome.

" The ſplintered fragments, pricking and tearing the muſcles, nerves, &c. already wounded, augment the ſwelling, inflammation, and effuſions; and often occaſion gangrene and mortification in conſequence, which perhaps would not elſe have happened. Theſe accidents are ordinarily followed with fever, delirium, convulſive ſtartings, in one word, with general diſorder of the whole animal œconomy. Beſides this, the fragments may be ſo much diſplaced as to tear ſome conſiderable veſſel, and cauſe an hæmorrhage not to be remedied but by immediate amputation of the member; or, if not diſcovered in time, the hæmorrhage may prove mortal.

" People wounded in war, after having undergone the pains and dangers of a firſt tranſporting, are almoſt always expoſed to new pains and freſh dangers, greater than the firſt, on account of the changing their ſituation, becauſe of their number, or for other reaſons of which the detail is unneceſſary. I ſay, the dangers to which a ſecond tranſporting expoſes them are greater than the firſt; becauſe the ſick, having already ſuffered abundantly, are leſs in condition to ſupport freſh fatigue; and beſides, the motion of the carriage, in ſpite of all the precaution taken in ſuch caſes, may not only cauſe all the miſchiefs which I have already enumerated when ſpeaking of the firſt tranſporting, but may alſo, by the derangement of the fragments, and the irritation of the ſenſible parts, diſturb the ſuppuration already eſtabliſhed, or about to be ſo; and thus occaſion a a retroceſſion of the purulent matter: A circumſtance which is known ordinarity to prove fatal.

" The concern which one ought to take for the ſolace and preſervation of people wounded, while generouſly expoſing their life for the State, has excited me in a particular manner to inveſtigate means to prevent all theſe inconveniencies. I am inſtigated with the greater ardour in this purſuit, ſince my labours, at the ſame time that they are uſeful to the warrior, cannot fail, in like manner, to prove ſo to other claſſes of mankind, who follow perilous profeſſions and exerciſes, ſuch as maſons, ſlaters, plumbers, lovers of the chace, &c. &c."

M. la Faye then goes on to deſcribe a machine which he recommends for the purpoſe of facilitating the conveyance of the people in this unhappy ſituation.

Without depretiating the invention of M. la Faye, I proceed to obſerve, that the thigh and leg machines above deſcribed will alſo very well anſwer the ſame purpoſe. They both may be applied without ſtripping the patient; and when properly applied, very perfectly ſecure the parts againſt the ſmalleſt degree of alteration, even from the movement of a carriage.

In ſhips of war, fractures of the limbs are no uncommon accidents: the difficulties of effecting retention of the fragments, while the patients remain on ſhip-board, but more eſpecially when it is found neceſſary to convey ſuch patients from one ſhip to another, or to hoſpitals a-ſhore, muſt be fully greater than theſe which reſult from ſimilar accidents on land. Contrivances, ſuch as are mentioned above, are here likely to perform the moſt important ſervices.

Mr Wathen, an ingenious Surgeon, has deſcribed a machine, which he calls a Conductor; purpoſely invented to retain fractures of the leg-bones, where it is found neceſſary to tranſport the patient. The leg-machines above mentioned are much leſs cumberſome than the Conductor, and perhaps give greater ſecurity.

EXPLANATION OF THE FIRST PLATE.

Fig. 1. repreſents a machine for retaining the fractured thigh; its ſtructure has been already explained.

AAA, The upper circular, which ſurrounds the pelvis, properly ſtuffed, and the opening a little to one ſide, to ſhut after it is applied by ſtuds, which have correſponding holes. Two obſcure joints are repreſented in its back-part.

BB, two thick and ſoft ſtraps, forked at the anterior ends, to be paſſed from behind forward, to prevent the circular from being puſhed upwards by the

CCC, graduated ſplints, which extend to

DD, the inferior circular, that reſts immediately above the knee.

The dotted lines ſhow how the ſplints and inferior circular may be changed from the one ſide to the other; and conſequently how this machine may be adapted to either thigh occaſionally, or to both at the ſame time.

Fig. 2. gives a view of the leg-machine, conſiſting of two circulars and the connecting graduated ſplints. The upper circular is applied immediately below the knee, and the inferior one above the ancle.

Fig. 3. exhibits a leg, to which the machine delineated in fig. 2. is applied, which has a laced half-boot inſtead of the inferior circular.

Fig. 4, gives a ſketch of the leg-machine, with a laced ſhoe inſtead of the inferior circular.

The dotted lines explain the manner in which this machine may be employed with full effect to maintain the extended poſition of the foot, to favour retention of the fractured tendo achillis.

EXPLANATION OF THE SECOND PLATD.

Fig, 1. exhibits an outſide ſplint for the fractured thigh, with its hollow ſurface AA, properly lined or covered with ſoft materials: it has a flexure at its lower end correſponding to the form of the ſide of the knee in a ſtate of ſemiflexion.

BB, ſtrong tapes which are paſſed through flat loops on the convex ſide, to be tied over.

FIG. 2. the ſplint for the inſide. This, lined and covered like the other end, when properly adapted to the two, ought to embrace the thigh completely, or nearly ſo. If this inſide ſplint is made with a flexure at the lower end, like the other, the retentive effect is thereby encreaſed.

FIG. 3. exhibits a view of the machine of Mr Gooch's for the fractured thigh: its mechaniſm will be underſtood from what has been premiſed.

FIG. 4. gives a repreſentation of the machine of Hildanus for the fractured thigh, formerly adverted to.

FIG. 5. ſhows the appearance of a paſteboard ſplint for the fractured leg, covered with the lining, which ought to be of doubled flannel, ſtitched to it, and ſtraps alſo fixed to the outſide, to be tied over the oppoſite one. The number of them may be various.

FIG. 6. is a delineation of Mr Sharp's bandage for fractures of the leg or arm, eſpecially when compound, intended to ſuperſede thoſe commonly called Eighteen, &c. tail'd bandages.

EXPLANATION OF THE THIRD PLATE.

FIG. I. exhibits a tin or copper ſplint, properly excavated to receive the outer part of the right leg, from above the knee downward, with its ſtraps paſſed through flat loops on the convex part. There is a hole which is ſuppoſed to correſpond to the wound of the compound fracture, which may be varied as to form, &c. as has been remarked.

FIG. 2. is a view of the ſort of ſplint much recommended by Mr Gooch, formed of ſlips of thin wood glued upon leather. This ſplint may be applied accurately to a cylindrical ſurface; but no part of our limbs has this form; therefore its uſe is much limited, and indeed ſuperſeded by the other.

EXPLA-

EXPLANATION OF THE FOURTH PLATE.

FIG. 1. is a delineation of the ſplint repreſented in Plate III. fig. 1. divided tranſverſely with its concave ſurface ſeen: it is lined and accommodated with a graduated ſplint, by which it is capable of ſuiting legs conſiderably different in ſize.

FIG. 2. is a view of the convex ſide of the ſame ſplint, to explain the manner in which the ſplint is fixed to the two pieces, ſo as to produce the effect mentioned.

EXPLANATION OF THE FIFTH PLATE.

FIG. 1. exhibits a view of the convexity of a tin or copper ſplint, with a hole for allowing the diſcharge of the matter from the compound fracture, and capable to include the correſponding ſide of the foot entirely. It is ſuppoſed to be provided with two leather-belts, with buckles, paſſed through flat loops.

FIG. 2. ſhews one with a hole for accommodating the ancle, and the foot-part of it leſs extended than that exhibited in the preceding figure.

Fig. 1.

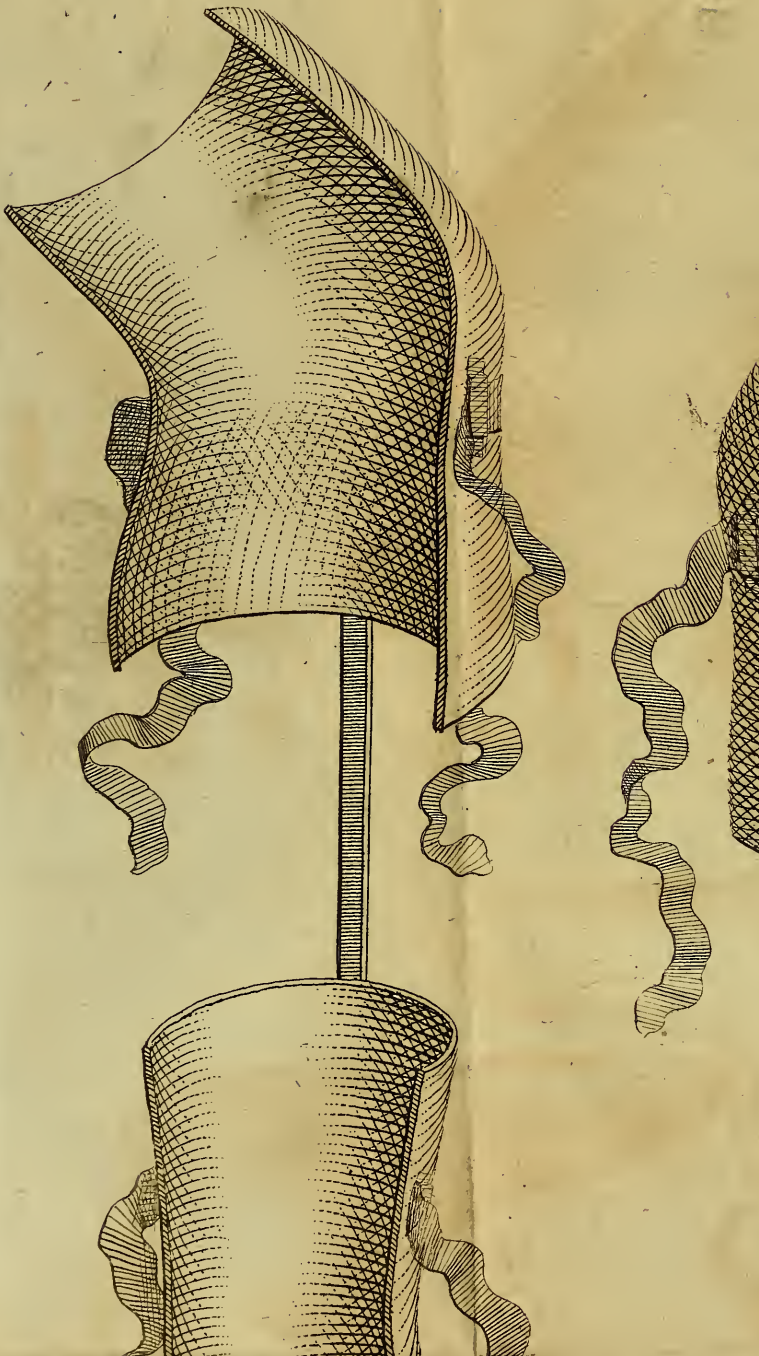


Fig. 2.

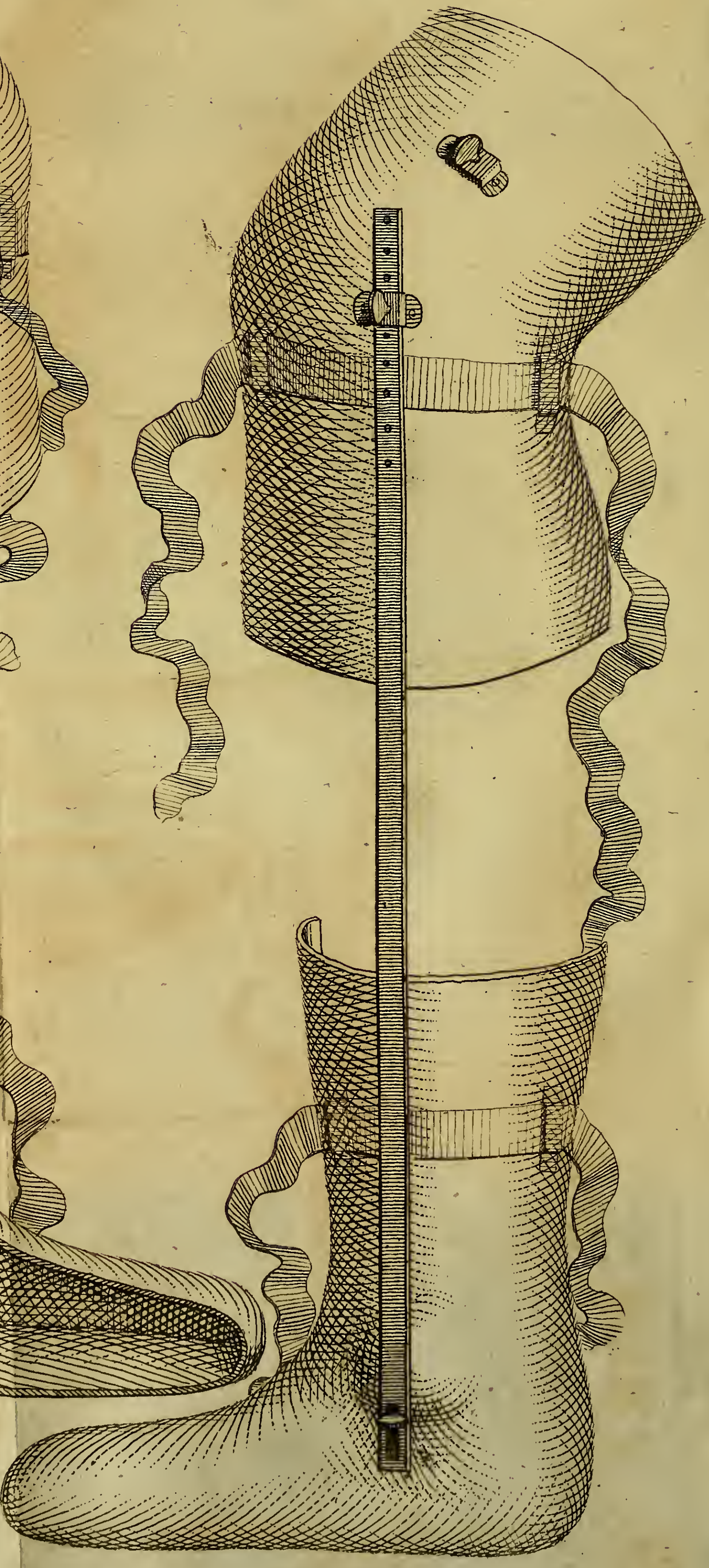


Plate V.

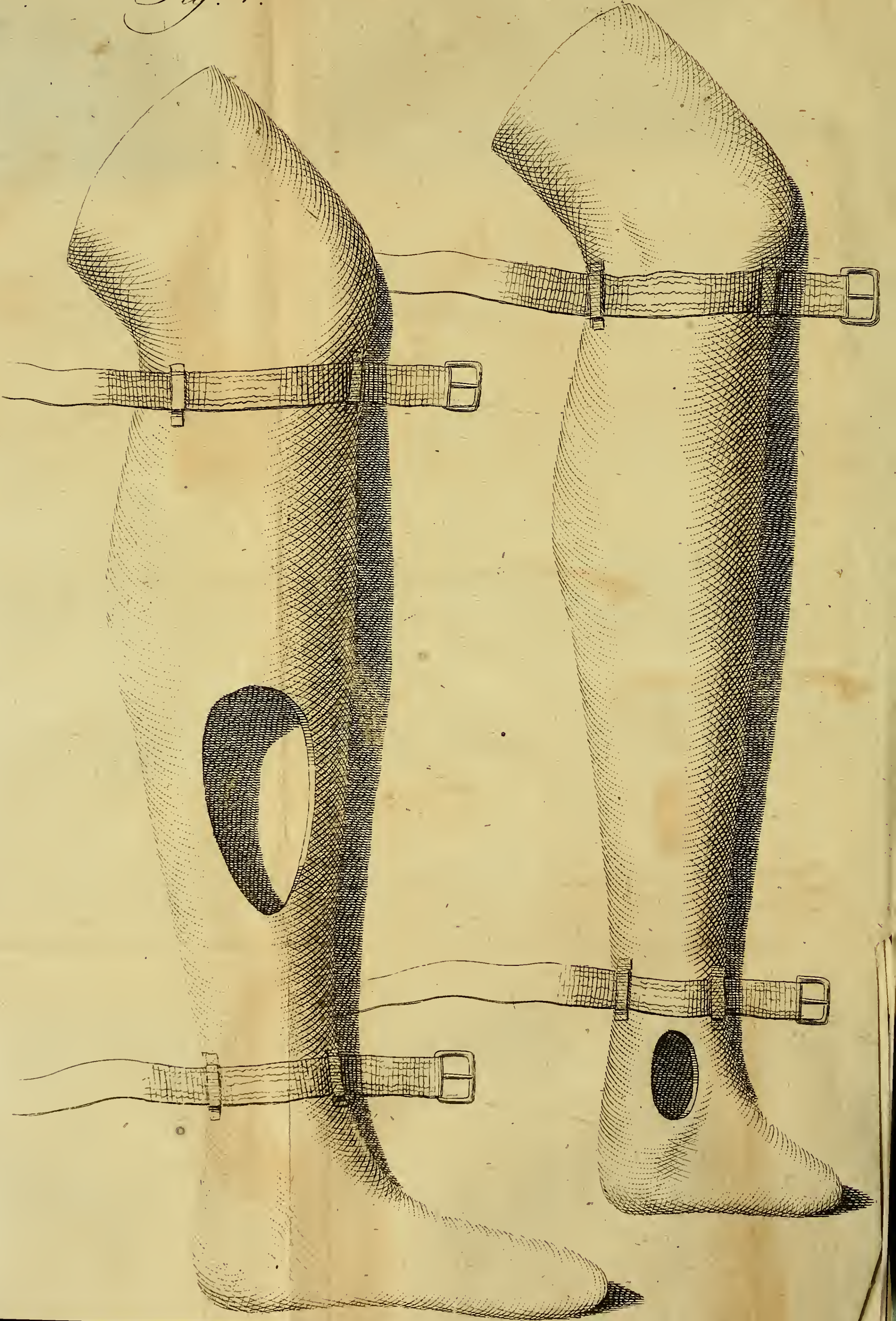


Fig. 1.

Fig. 2.

OF FRACTURE OF THE TENDO ACHILLIS.

THE Tendo Achillis is often fractured, by violent efforts of the extenſor-muſcles of the foot, in dancing, jumping, &c. or divided with cutting inſtruments, The former caſe is analogous to ſimple, the other to compound fracture of the bones.

Although there is no external wound, the fracture, or, more ſtrictly ſpeaking, the wound of the tendon, diſcovers itſelf immediately, by the conſequent inability of ſupporting the body on the affected leg with any degree of firmneſs.

In both caſes, retention, or the perfect chirurgic cure, depends entirely on maintaining the foot in an extended poſture, ſo as that the parts of the divided tendon may be kept in exact oppoſition, and contiguous, (in the ſame manner as the fragments of the bones), till they are re-united.

The ſame method of cure is to be proſecuted for partial diviſions of this tendon, and for deep tranſverſe wounds of the gnoſtrocnemius muſcle, whether immediately at or near where they become tendinous.

Various methods of maintaining the extended poſture of the foot, to produce the deſired retention, have been recommended by authors. Mr Gooch adviſes the following one:

"The ends of the divided tendon are to be brought and kept as near together as poſſible, by a favourable poſture of the limb; which is effected by bending the knee and heel, and extending the foot to ſuch a degree as is eaſy to the patient; keeping it ſo, after dreſſing the wound, by the following bandage: Firſt, equaliſing the ſmall of the leg, with ſoft well-adapted compreſſes of linen cloth, fine tow, or quilting cotton, the latter of which is prefereble to others.

"Begin the bandage by making a few circular turns of a roller of a ſufficient length and breadth about the thigh, juſt above the knee, paſſing it round below, two or three times, in a figure of 8; deſcending then in regular and ſmall edgings, that it may be even and eaſy down to the ancle; making then a few turns, as about the knee, proceeding ſpirally to the toes; when, after making a few circulars, the roller is to be faſtened with a needle and thread; reflecting it from thence upon the ſoal of the foot, up the back part of the leg, to the circulars above the knee; ſewing it well there, and in the whole courſe of it, with a needle and thread; taking particular care, all the while, to have the leg kept in its true favourable poſture, by aſſiſtants; and when this is done, it is neceſſary to have it reſted upon a pillow in bed, ſtrictly enjoining the patient's own care to keep the limb quiet. The application of this bandage may be begun upon the foot at the toes; leaving a portion of the roller then to be reflected, fixed, and ſecured, as above deſcribed."

Although there ſhould be no attending wound, this method by the roller-bandage muſt be exceedingly troubleſome and laborious, and I think imperfect; but where there is a wound, it muſt prove much more ſo: Beſides, the extenſion of the foot cannot be graduated without undoing almoſt the whole roller.

The celebrated M. Petit invented the following method for effecting the retention in queſtion, by which the extenſion can be regulated at pleaſure.

A ſandal or ſhoe, with a low quarter-heel, is put upon the foot; from its back-part a ſtrong ſtrap paſſes up the leg to the back-part or hollow of the ham, where a ſmall axis in peritrochio is placed, and ſecured by means of a broad circular, ſo divided in its fore-part, that one half paſſes above and the other below the knee. By turning the axis, which is provided with a handle, the ſtrap from the heel can be ſhortened or relaxed at pleaſure, and conſequently the foot proportionally extended. If there is a wound, nothing impedes the neceſſary dreſſing.

A method almoſt ſimilar, though more ſimple, was practiſed by the late Profeſſor Dr Monro. He made uſe of a foot-ſock, or ſlipper of tiking, (Plate VI. fig. 1.), open at the toes, to prevent them from being ſqueezed, when the extenſion was made by a ſtrap, which went from the back-part of the ſock to fix above the calf, to a circular, or calf-piece, (fig. 2.), which ſurrounded the leg here, and laced before by means of pye-holes. The ſtrap was graduated by the help of a buckle, (fig. 3.), in place of the axis in peritrochio of M. Petit. He wore this dreſſing for fifteen days, without moving the foot. To prevent too great extenſion of the foot, at the end of ſix weeks, when he was obliged to go abroad, he wore a ſhoe with a very high heel, (fig. 4.). For greater ſecurity ſtill, for five months more, he had a piece of ſteel, (fig. 5.), that reached from the broad of the foot to the fore-part of the leg; at both ends, this ſteel-machine was flat and ſtuffed, to give as little uneaſineſs as poſſible: it was ſecured by ribbands.

A moſt complete cure was the reward of all this caution and ingenuity.

I tried this plan of retention in the caſe of a gentleman; but finding his leg ſhrunk conſiderably from the preſſure of the calf-piece, I lengthened it, ſo as to make it extend half-way up the thigh; and finally, which is an obvious improvement of this apparatus, I ſubſtituted a pair of ſtrong drawers, to the point of which, correſponding to the ham, the ſtrap of the ſandal and buckle were fixed like a boot to the breeches. I thus obtained a complete cure.

When the fore-ſplint of the leg-machine is removed, as is repreſented by the dotted lines Pl. I. fig. 4. the foot is very readily made to aſſume the extended ſituation; and as readily maintains that ſituation, if a ſtraight ſplint is made to paſs from the circular to the point of the ſhoe. By means of the ſcrew-nail in the plate of the circular, it may be eaſily comprehended how accurately the quantity of the extenſion of the foot may be graduated;

and, when determined, maintained with the utmoſt ſteadineſs.

Since treating the caſe already recited, I have deviſed a ſlight alteration in the ſplint recommended for retention of the fractured leg, that completely ſuperſedes every contrivance hitherto propoſed for that of the fractured tendon of Achillis.

The ſplints (Plate VII.) are ſo ſhaped at the ancle part, that they keep it unavoidably in the extended poſture, and at the ſame time ſecure the knee in a ſtate of ſemiflexion; by which the gaſtrocnemius muſcle, which is attached to the os femoris, is kept relaxed: An advantage not to be derived from any of the plans of retention hitherto deſcribed.

This machine offers itſelf, therefore, as ſecond to none, as far as I know, in ſimplicity, ſafety, ſecurity, and eaſe. By it the time of confinement may be much abridged; in a very ſhort time, the patient may venture abroad with the greateſt ſafety, in a carriage, on horſeback, or with crutches: by it the toes are in no danger of being ſqueezed or cruſhed. Wounds attending fractures or partial diviſions of this tendon, or wounds of its muſcles near its commencement, can be dreſſed with the greateſt freedom.

EXPLANATION OF THE SIXTH PLATE.

THIS Plate exhibits the apparatus partly invented and employed by the late Profeſſor Dr Monro, in his own caſe, of which a full account is given in Eſſays and Obſervations, Phyſical and Literary.

FIG. I. repreſents the tiking ſandal open at the toe-part, and with a ſtrap from its heel-part, to be buckled to

FIG. 2. the calf-piece, which is fixed by a lace above the calf, ſo that the buckle falls directly behind, to correſpond with the ſtrap of the ſandal.

FIG. 3. exhibits a leg, with the foot duly extended

Plate VI.

Fig. 1.

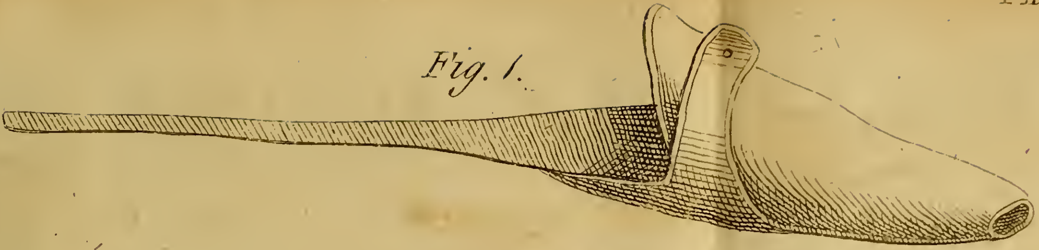


Fig. 2.

Fig. 3.

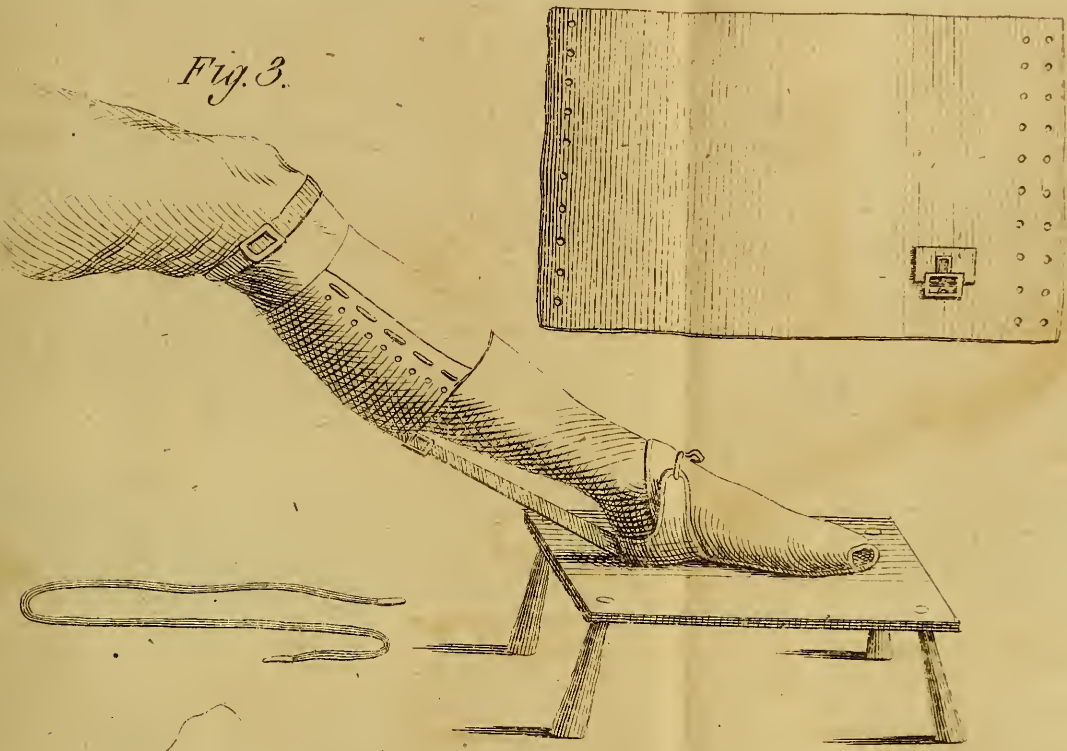
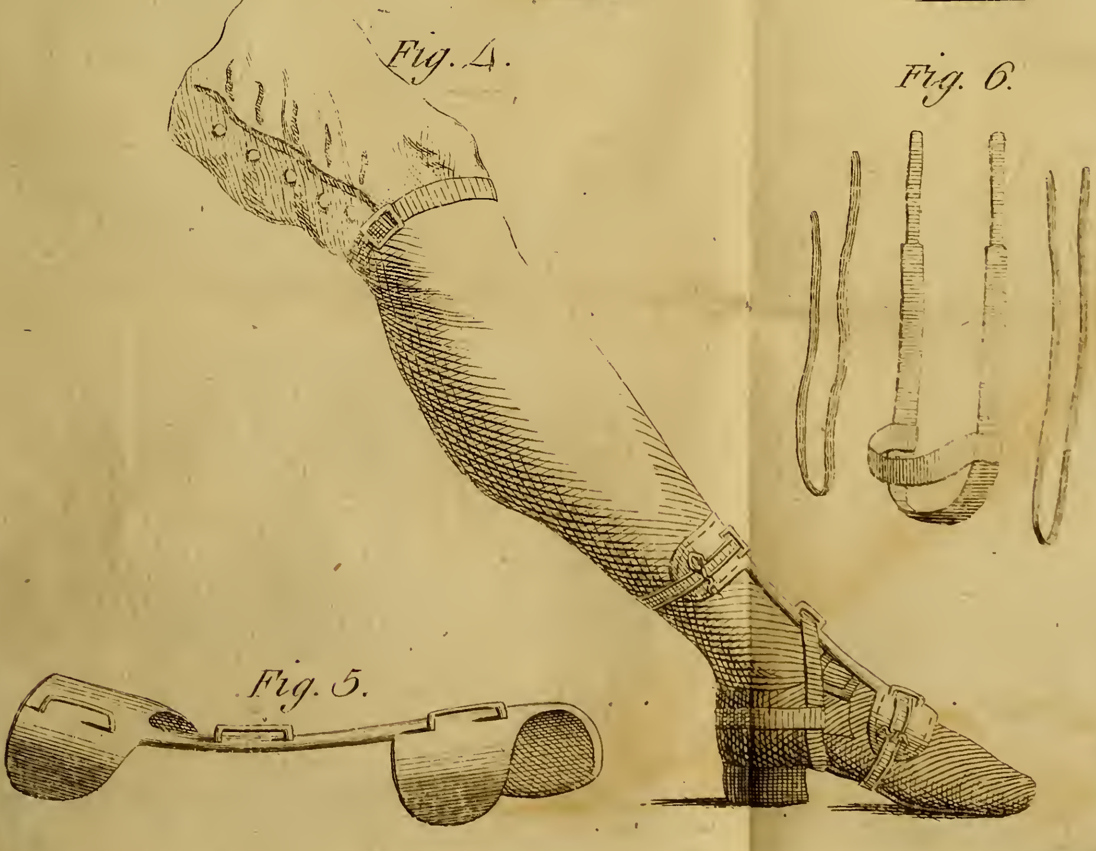


Fig. 4.

Fig. 5.

Fig. 6.



tended, and reſting on a ſtool, to which the ſanſal and calf-piece are applied, and the manner of their connection by the ſtrap and buckle ſhewn.

FIG. 4. is a delineation of a leg, in the ſame poſition as that of FIG. 3. but with a high-heeled ſhoe inſtead of the ſandal, and with the ſplint,

FIG. 5. reaching from the fore-part of the leg to the upper part of the foot, properly ſecured by the ſtraps,

FIG. 6. ſo that no motion at the ancle is permitted.

EXPLANATION OF THE SEVENTH PLATE.

THIS gives a view of the ſplints adapted to the leg, with the broken tendon of Achillis.

FIG. 1. exhibits one of them, ſo formed that it may be applied to the back-part of the leg; and it is ſuppoſed that a correſponding one is fitted to its fore-part, ſo as completely to inveſt the leg; they are then ſecured immoveably by the ſtraps and buckles ſhewn in

FIG. 2. which gives a view of another ſplint for this purpoſe, ſo ſhaped that it applies to the leg laterally; by this, and a correſponding one, the leg is wholely incloſed; and when the ſtraps are properly buckled or tied, they abſolutely prevent any motion of the knee or ancle; which is a circumſtance of great effect, as explained above.

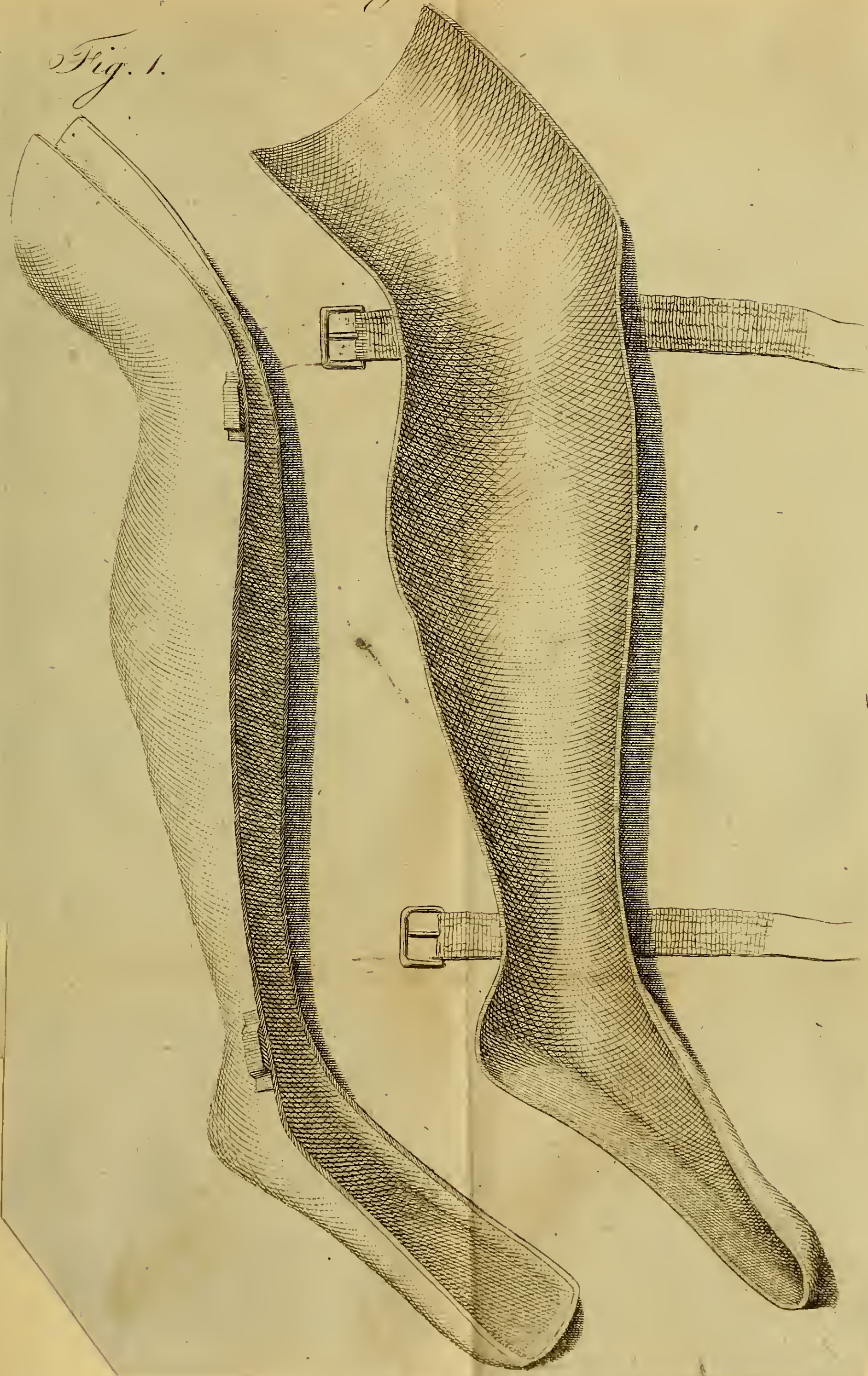


Fig. 1.

Fig. 2.

Of the Fractured Patella.

THE patella, rotula, or knee-pan, is ſometimes, though very unaccountably, fractured in a longitudinal direction with reſpect to the leg. This bone, however, for very evident reaſons, is moſt frequently fractured in a tranſverſe direction.

The cure of the tranſverſe fracture of this bone is rendered very difficult by its flat roundiſh form, by the neighbourhood of the knee, but eſpecially by the contraction of the very ſtrong extenſor-muſcles of the leg, which are attached to its upper edge. Sometimes it is ſo unequally divided, that only a very ſmall fragment adheres to the tendons of theſe extenſor-muſcles: A circumſtance which adds very conſiderably to the difficulty of retention.

Like all other fractures, the cure here is to be attempted by approximating and keeping contiguous the fragments of the bone; to effect this, the extended poſture of the leg with reſpect to the thigh, and the bended poſture of this with reſpect to the trunk of the body, are abſolutely requiſite.

It very ſeldom happens, that the fragments of the patella are firmly united by callus: on the contrary, they are fixed to one another by a ligamentous, or, at any rate, a flexible ſubſtance, of various length. I ſaw an inſtance of this kind at the Hague, in the collection of the late reſpectable Dr Camper. The perſon to whom it belonged, during the cure of the fracture, was attended by the Doctor, and at his death ordered that it ſhould be delivered to him.

This circumſtance unqueſtionably reſults from a defective retention, and is not productive of any advantage. I therefore conclude, that the leſs intermediate ſubſtance, the better the cure.

M. Petit, to effect retention of the fragments of the patella, preſcribes as many compreſſes of various ſhapes, and as many bandages and rollers, of different lengths and breadths, as would require a great meaſure of patience properly to apply. The retentive powers of all ſoft pliant bandages, however dexterouſly they may be adapted, are here feeble, and for the moſt part inadequate; and when employed during the whole proceſs of the cure, (which I have known eight weeks inſufficient to obtain), the patient muſt be confined to bed; at leaſt the affected limb muſt be moved with the greateſt caution.

It will be evident how perfectly the retention of tranſverſe fractures of this bone may be accompliſhed, by the circular of the leg-machine, and the inferior one of the thigh-machine, connected laterally together by the jointed graduating ſplints, Plate I. Fig. 3. The back edges of theſe ſplints are to be turned forward, to prevent all flexion of the knee-joint: proper compreſſes of folded linen are alſo be interpoſed betwixt the circulars and knee-pan, eſpecially betwixt it and the upper one. The graduated connecting ſplints allow the circulars to be more or leſs approximated, as may be neceſſary.

The like effect may be produced by the knee-pieces of the leg-machine, repreſented in Plate IV. properly applied and ſecured in juſt oppoſition. This apparatus keeps the joint in a gentle flexion, which ſome think to be an advantage; but it may be made ſo as to keep it quite extended, which is the preferable poſition.

It will be obſerved, that as all motion of the knee-joint, by this mode of retaining the fractured patella, becomes impoſſible, the neceſſity of confining the patient to bed for any length of time is ſuperſeded: on the contrary, he may move about with a good deal of ſafety after a few days. The circulars require to be applied with much leſs ſtrictneſs than the roller-bandages commonly employed.

The firſt Figure of the eighth Plate repreſents a leather-bandage for approximating the fragments of the patella; but it will be immediately perceived, that the aſſiſtance of the machines already deſcribed is wanted.

The method of cure here propoſed for fractures of the patella, will anſwer equally well, if at any time the ligament connecting it with the tibia is ruptured.

OF THE FRACTURED CLAVICLE.

THE Clavicle partakes a good deal of the form and poſition of the ribs. It is placed almoſt horizontally between the acromion ſcapulæ and the correſponding angle of the top of the ſternum, and conſequently is the ſole connection between the bones of the ſuperior extremity and the reſt of the ſkeleton. It is in fact the fulcrum on which this extremity is ſupported during many of its motions, while it prevents the ſhoulder from approaching too near to the ſternum.

All the circumſtances of the Clavicle duly conſidered,

ſidered, it will be perceived, that it is neceſſarily, on many occaſions, ſubjected to great ſtrain in the moſt unfavourable manner. It is not therefore ſurpriſing that it ſhould be fractured generally about the middle part that arches a little forward.

As the Clavicle is comparatively placed ſuperficially, its condition can be eaſily examined and aſcertained; and conſequently fracture of it readily detected. In general, the one fragment riſes a little over the other, and produces a ſmall tumour.

This fracture is often, and without much inconvenience, left to the natural cure: however, it is obvious, that the chirurgic cure ought not to be neglected; eſpecially in the female patient, to whom the exact preſervation of the natural form may be deemed a matter of importance.

The retention is eaſily effected, by drawing the ſhoulder connected with the fractured Clavicle duly backward; and then preſſing the diſplaced fragments gently into their ſituation.

It is more difficult, on many accounts, to obtain due retention, particularly the ſmall ſurface of the fragments in contact, and the almoſt unavoidable motion of the arm.

The beſt method I know, and I have often experienced its good effect, is, to apply a long roller, in the form of the figure of 8, behind, between the ſhoulders, ſo as to approximate the baſes of the ſcapulæ more than uſual to one another. By this means the requiſite degree of extenſion is produced and ſupported. Full retention is then obtained, by placing compreſſes over the place of the fracture, ſo as to equalize it, that it may receive the retentive preſſure of the ſpica ſcapularis, ſo applied as entirely to cover the ſeat of the diſeaſe.

To be ſuccefsful, theſe rollers ſhould be long, made of flannel, and about three inches in breadth. It is unneceſſary to remove them for three or four weeks.

OF LUXATIONS.

DEFINITION.

LUXATION and Diſlocation are terms uſed by Surgeons to expreſs the loſs of ſituation of the extremity of a bone or bones concerned in the ſtructure of a joint poſſeſſing motion, with various injury of the adjoining parts. When this is not complete, it is called a Subluxation, which ſeldom occurs.

Although the following obſervations chiefly refer to Luxation of the bones of the extremities; yet, as far as they are founded on general principles, they muſt be applicable to every variety of the diſeaſe.

On

OF THE CAUSES.

A Bone is liable to be luxated in proportion to the quantity of motion of the joint of which it forms a part; or, in other words, the more extenſive the motion of a joint, the more ſuſceptible is it of luxation from a given cauſe. Accordingly we obſerve, that the ſhoulder-joint is moſt frequently the ſeat of the diſeaſe in queſtion.

It is underſtood, that we are treating of idiopathic luxation, of which external violence, viz. ſtrokes, falls, &c. often aſſiſted by the luxated bone as a lever, is the occaſional cauſe; for when this diſeaſe flows from internal cauſes, gradually altering the ligaments, and other component parts of a joint, it is ſymptomatic, and does not receive the chirurgic cure hereafter deſcribed,

bed, till the primary be ſubverted, as was remarked with regard to ſymptomatic fracture.

It is obvious, that in this, as in every diſeaſe, the occaſional cauſe muſt operate in various degree, according to circumſtances, to produce its full effect. Indeed ſometimes it is ſo exceſſive as to injure the adjoining parts ſo extenſively, that the affection may, in alluſion to fracture, be named compound Luxation. Thus, I have ſeen the extremities of the bones of the fore-arm protruded by the luxating violence through the ſoft parts of the wriſt-joint above the palm.

When a low degree of a luxating power has acted, ſubluxation is the conſequence.

OF THE SYMPTOMS.

THE ſymptoms which mark a luxation have a great affinity to thoſe of fracture.

1. Pain variouſly intenſe, eſpecially when the joint is diſturbed. This perhaps flows in ſome degree from the laceration of the capſular ligaments, which happens always proportionally, but principally from the derangement of the attached muſcles, which are ſometimes much violated, and from the preſſure of the luxated bone againſt the nerves and veſſels.

2. Loſs of the uſual form or appearance of the ſuſpected joint. This, being various in degree, muſt be variouſly conſpicuous. The cauſe is eaſily aſſigned. It was formerly remarked, that the general figure of our body depends greatly on the bones, and their due arrangement. When, therefore, a bone is luxated, an alteration of the external form of the joint in which it is concerned is a neceſſary conſequence; eſpecially as the diſplaced bone is by the muſcles generally drawn unduly upward, and thus the limb more or leſs ſhortened.

3. Diminiſhed motion. This is an unavoidable

effect of luxation, and always exiſts more or leſs.

4. Swelling occupying the circumference of the joint in which the luxation has taken place. It was formerly obſerved, that there ſeemed to be a fixed connection between certain degrees of pain and ſwelling. This partly, then, accounts for the ſymptom in queſtion; which is ſometimes ſo conſiderable, and accedes ſo ſuddenly, as to obſcure the others. The greater degrees of tumefaction partake of the nature of ecchymoſis, being cauſed by blood effuſed from luxated veſſels. Much depends on the mode of the occaſional cauſe.

The pain and ſwelling are only preſent in the recent luxation; for by degrees the irritation on which they depend ceaſes.

OF THE DIAGNOSIS.

THE enumerated ſymptoms will in general be ſufficient to furniſh a diagnoſis. Indeed there are few affections with which there is any riſk of confounding this in queſtion. Fracture near a joint, and contuſion accompanied with much ſwelling, may ſometimes occaſion perplexity; but a full inveſtigation, joined with anatomical information, which is indiſpenſible, will ſoon diſpel it. Profeſſional character is here eaſily loſt.

OF THE PROGNOSIS.

IT may be affirmed from experience, that luxation in general is not dangerous: on the contrary, it is very curable. In the young ſubject, and in a recent affection, a cure may be expected more readily than in oppoſite circumſtances. Indeed, in every caſe, I am much diſpoſed to believe a cure is obtainable; and that therefore failure is to be ſtated againſt the Surgeon.

OF THE CURE.

LIKE that of fracture, the cure of Luxation is both natural and artificial.

Nature, or the healing power, makes no effort to replace the luxated bone. This can only be effected by art or Surgery, and is the artificial or chirurgic part of the cure. But nature accommodates, as it were, the bone in its new ſituation, as much as poſſible. In ſome inſtances, a new ſocket is provided for it; and in every caſe a concretion is formed betwixt its torn ligaments and the cellular ſubſtance with which they may have come into contact; and in like manner, after the bone has been reſtored to its place, this healing power muſt reſtore the ligaments and injured parts to ſoundneſs, which happens with various expedition, according to the degree of violation they had ſuſtained.

It will appear from what is premiſed, that the chirurgic cure is indiſpenſable. It requires

1. Extenſion, and

2. Retention.

OF EXTENSION.

EXTENSION is neceſſary to draw down the luxated bone to its proper ſituation; for it is conſtantly moved upwards by the muſcles, whoſe action is much increaſed by the irritation to which they are now ſubjected.

As the muſcles conſtitute almoſt the whole reſiſtance to be overcome by extenſion, it is reaſonable previouſly to relax theſe as much as poſſible, as was obſerved when treating of fractures. This is principally done by ſemiflexion of the leg or arm at the knee or elbow.

As in the caſe of fracture, the drawing muſt only be applied to the affected bone; for applying it to a more diſtant one is incompatible with the relaxed diſpoſition of the muſcles already mentioned, and hurtfully ſubjects the intermediate joint or joints to unneceſſary racking.

The extenſion ought at firſt to be attempted, eſpecially when the patient is young, by the Surgeon alone; for in Surgery, I conſider it to be a fixed maxim, That in every operation the Surgeon is not to be indebted to another for performing what he conveniently might have done himſelf; and that he is not to recur to the mechanical powers or machinery for that exertion which may be furniſhed by himſelf and aſſiſtants.

From a low and gentle degree of extenſion, in a juſt direction, the Surgeon muſt gradually proceed to greater and greater, according to the reſiſtance, till the luxated bone be retracted to what may called the level of its ſocket, which by the muſcular action it then ſuddenly re-occupies, and generally in doing ſo gives an audible ſtroke againſt it.

OF RETENTION.

RETENTION, it will be underſtood, may be truſted to the muſcular action, which preſſes the reduced bone firmly into its place; but where the parts have been much violated, it may be neceſſary to apply a proper bandage, and to put the limb in the relaxed poſture, or, in other words, to recur to ſuitable dilegation and poſture till they be confirmed.

I have ſcarcely in any inſtance found it neceſſary to attend much to retention.

HAVING thus premiſed the general doctrine, it may be proper to advert ſomewhat to the more intereſting particular luxations.

Of Luxation in the Shoulder-joint.

WHEN the ſuperior extremity of the os humeri, or arm-bone, is driven from its ſocket, or the gloinid cavity of the ſcapula, or ſhoulder-blade, luxation is ſaid to exiſt in the ſhoulder-joint; and, for reaſons aſſigned above, this is by far the moſt frequent.

The acromion proceſs of the ſhoulder-blade is ſo placed, and connected with the correſponding extremity of the clavicle, that the diſlocated head of the arm-bone is prevented from moving upward or backward: it is therefore determined to ſlip forward and downward till it is diſengaged from its ſocket; and then is retracted upwards;

ſo that it is always, or almoſt always, lodged in the upper part of the arm-pit, above the margin of its ſocket, or ſomewhat forward, under the edge of the great pectoral muſcle, where it can in general be eaſily felt, eſpecially if the arm be made to roll a little about its axis. As the deltoid muſcle is now unſupported by the round extremity of the arm-bone, it becomes comparatively flat, or, in other words, the ſhoulder loſes its natural rotundity and form; which affords the well-informed Surgeon a very certain diagnoſtic.

While the diſlocated arm-bone is ſituated as deſcribed, it is evident, that the ſhort muſcles inſerted near its head muſt be greatly deranged, particularly the ſupra-ſpinatus and the infra-ſpinatus muſt be much ſtretched. Indeed in ſome caſes I have ſuſpected a laceration. Theſe circumſtances ſufficiently account for the pain, independently of the preſſure and diſturbance to which the axillary nerves and veſſels may be ſubjected from the end of the arm-bone in its new ſituation.

It may be proper to recount the moſt probable and efficient modes of extenſion that have been propoſed, or that may be practiſed; and then, by comparing them, make a ſelection ſuited to the particular circumſtances of any occurring caſe.

1. The patient may be placed in a chair of proper height; the Surgeon lays firm hold of the arm above the elbow with one hand, the othe he applies to the ſhoulder, near the joint, ſ as to counteract, while he attempts to extend; or he may attempt, with the hand applied to the arm, to elevate the patient ſomewhat, and with the fingers of the other, preſſed under the head of the luxated bone, which is generally eaſily felt in the arm-pit, attempt to raiſe it to the level of the ſocket.

This method I have ſometimes tried ſucceſsfully; but it will be underſtood, that it is only ſuited to young and ſlender ſubjects; and even in theſe to recent caſes; becauſe, in other circumſtances, the Surgeon's ſtrength, which is the only extending power, is likely to be inadequate to the reſiſtance.

2. The patient may be laid on the chamber-floor, ſpread with carpet or blanket; the Surgeon then ſits down by him, ſo that he may be able to apply his heel, or rather ſoal, to the patient's ſide, near the axilla, correſponding to the luxated bone; then he graſps firmly the arm above the elbow, and attempts the neceſſary extenſion, counteracting properly with his heel: inſtead of applying his hand to the naked arm, he may, if neceſſary, employ lacs hereafter deſcribed.

Thus, drawing by the arm is clearly preferable to the ordinary method of doing it by the hand; becauſe we obtain the advantage of the relaxed ſtate of the muſcles, and avoid racking the elbow and wriſt joints.

I have never tried this method. Performed as deſcribed, it may enable the Surgeon to reduce without aſſiſtants, in caſes of luxation, that otherwiſe

therwiſe would require other means equally powerful.

3. The patient is to be placed on a ſtrong chair, (indeed in Hoſpitals one particularly ſtrong and properly ſized ſhould be made on purpoſe), with its back ſo high, that, when properly covered with a pillow or blanket, it may reach to his axilla when he is ſeated ſide-ways, as is repreſented in Plate IX. Above the elbow, a lac of a proper form is to be applied; without which a ſufficient number of aſſiſtants could not ſeize the arm in its relaxed ſtate, and act in concert.

A great deal of the chance of ſucceeding depends on the lac. A common towel ſurrounding the arm twice immediately above the elbow, and then knotted once, and the aſſiſtants drawing by the projecting ends, is a very exceptionable one; for in proportion to the drawing is the running ſtricture; ſo that it ſoon becomes intolerable. Therefore, if we are to uſe the towel at all, we muſt knot it for good, and introduce ſtraps or cords of ſufficient ſtrength, betwixt it and the ſurface of the arm, and order the aſſiſtants to draw by them; by this means, what I have called the running ſtricture is avoided.

In the ſecond figure of the eighth Plate, a lac is repreſented, which will anſwer well when exceſſive drawing is not wanted. Its ſize and ſhape are adapted to the ſurface of the arm immediately above the elbow, while in the bent poſi ion, for which ſuitable notch in the inner part of its inferior margin. It is ſtuffed and lined, to diminiſh the preſſure when it is firmly fixed by belts and correſponding buckles, ſo as to graſp ſecurely the os humeri above the condyles, ſo as not to ſlip down during the drawing; which is effected by cords looped on the ſtrong hooks, ſecurely fixed at proper diſtances, on the external ſurface; ſo that one reſts on the external, the other on the internal part of the arm, above the joint.

I have repeatedly employed this with due effect; in ſome caſes, however, where a great extending force was neceſſary, I have found it unable to keep its ſituation, which either retards or defeats the proceſs. This circuſtance ſuggeſted the one repreſented, applied properly to the arm, in Plate IX.

This lac conſiſts of two ſtrong and long ſtraps of girthing, placed longitudinally on the external and internal naked ſurface of the arm, above the elbow. They are then ſecured by a piece of the ſame ſtuff, ſurrounding the arm by repeated ſerpentine turns, very firm, by the ends of the longitudinal ſtraps, tied reſpectively, to allow the aſſiſtants a very ſufficient hold, while the firmneſs of the circular one prevents them from ſlipping below the condyles and elbow, as happens ſometimes when the laſt deſcribed one it uſed, as has been remarked. This applies with equal effect to the thigh, as will be afterwards noticed. In a word, it is the ſimpleſt and beſt lac I know.

The lac and ſtraps being adjuſted, two or more aſſiſtants draw by the latter, at firſt gently, and always ſteadily, in various direction, as repreſented by the pricked lines in the figure laſt quoted; while the Surgeon ſtands behind the affected ſhoulder, to obſerve the changes, and to give the neceſſary directions to the aſſiſtants; while the chair is rendered immoveable by a ſtrong belt or rope, as expreſſed in Plate IX, connected to a poſt or ſome fined point. I have never failed in any attempts to reduce when this plan has been duly enecuted.

3. Inſtead of aſſiſtants, the Surgeon may employ what I call the foot-lever, as repreſented in the Plate above cited. The ſtraps connected with the lever, and the foot applied to the end of it may produce a great exertion, either by a ſteady preſſure, or in the ſtyle of a jerk; which laſt is excellently calculated to deſtroy obſtinate concretions and adheſions in inveterate caſes. I ſucceeded in this way in reducing a luxation of thirteen weeks duration.

4. While the entenſion is made in any way, ſome have employed a rolling-pin, placed in the axilla, to raiſe the head of the bone to the ſocket, by ſeizing both ends of it, and making an upward exertion.

This plan ſeems to be futile, if not hurtful; for, as has been noticed already, as ſoon as the head of the bone is reduced by the drawing to the

the level of the ſocket, it jumps ſpontaneouſly into it; and if the rolling-pin be uſed here, the bone is ſo ſituated, that it will give unneceſſary contuſion, and perhaps prevent the reduction that would otherwiſe enſue by preſſing its head againſt the projecting brim of its ſocket.

5. Inſtead of the rolling-pin, to raiſe the head of the bone during extenſion, ſome have adviſed, that the Surgeon ſhould have a ſtrong towel or ſcarf about his neck, with the doubling paſſed under the joint, near the arm-pit, and to make at the proper time a ſtrong elevation, by raiſing himſelf, and inclining his neck backwards. This is equally unneceſſary as the rolling-pin, but is not ſo likely to bruiſe the parts on which its preſſes.

6. By means of proper pullies, fixed to the cieling and to the lac, and connected by a ſtrong cord, the patient has been hoiſted, and even ſuſpended for ſome time, to procure reduction of the luxated arm-bone, in obſtinate caſes. It has been imagined, that the reſiſting muſcles thus be-

come fatigued and relaxed, and their reſiſtance diminiſhed or deſtroyed. I tried this method unſucceſsfully, in the caſe where reduction was effected by the foot-lever, as mentioned.

It may be remarked, that in this way the extending power is the weight of the patient's body; but in many inſtances, I am perfectly certain that a much greater power is wanted.

7. The lever ſupported on a proper fulcrum, aſſiſted by a little windlaſs, or axis in peretrochio, has been recommended for accompliſhing the buſineſs in queſtion, under the name of Ambe; of which the moſt improved hitherto deſcribed is that of Mr Freck, of which an account is given in the Philoſophical Tranſactions. I have ſeen this tried without effect; indeed the reaſon ſeems to me abundantly apparent: to render it probable, Mr Freck has made it ſo low, that the patient muſt ſit on the floor, and the Surgeon ſtoop, while uſing it; and therefore due exertions cannot be made; and, upon the whole, it is unſtable and too unſubſtantial.

I have corrected theſe defects in the ambe of Mr Freck, and given it additional powers, as will be underſtood from its figure in the tenth Plate.

The patient ſtands on the pedeſtal, and places the luxated arm gently bent, with the lac duly applied, on the lever, which is moveable in every direction. By means of a ſtrong cord, the lac is connected to the little windlaſs of the lever; and any requiſite extenſion is thus obtained before the lever is acted with, which enables the Surgeon to increaſe the extenſion at pleaſure by depreſſing it; and the peculiar or univerſal joint, as it is called, permits him to roll the bone about its axis; which contributes greatly to make it quit its near ſituation, and to deſtroy concretions in old caſes.

The fulcrum is about four feet high, which anſwers for patients of ordinary ſize. If it ſhould be found too high, the patient may be duly raiſed by a ſtool, or the like, under his feet. If it be too low, it may be heightened, as will be afterwards explained. Thus it becomes univerſally applicable.

If, while the Surgeon uſes the lever, the patient ſhould raiſe himſelf, and ſo far elude its operation, he muſt be kept down by an aſſiſtant, with his hands applied on the affected ſhoulder.

If it ſhould be found neceſſary to exert greater power, by the windlaſs fixed to the ſide of the fulcrum, the lever, which is joined to the top of a ſquare iron rod, with teeth correſponding to the pinion of the windlaſs, concealed in the fulcrum, may be raiſed, and with it the patient, ſo as to ſuſpend him, for the purpoſe already mentioned; and, finally, he may receive a jerk of any degree, to deſtroy concretions, or other obſtacles, by allowing the iron rod to fall ſuddenly into its ſocket.

It appears that this modification of the ambe is capable to give any degree of extending power, and in any direction. I may venture to aſſert, that no curable caſe of luxation in the arm-joint can reſiſt its influence. The Surgeons of our Infirmary found its ſuccefsful power in one or two obſtinate caſes, that had not yielded to other methods.

With regard to extenſion, I have repeatedly ſaid, that it ſhould be adjuſted to the reſiſtance, and gradually and cautiouſly encreaſed as this may require. When this is duly attended to, I think that no material injury can be done to the patient by tearing the muſcles, veſſels, &c. as ſome have imagined; for any ſuppoſable obſtacle muſt give way before any thing of that kind that can happen.

I therefore conclude, that every caſe of luxation not exceeding perhaps three or four months duration is curable. Indeed I had almoſt ventured to ſay, that every caſe whatever is ſafely reducible by one or other of the plans deſcribed.

If in any caſe of this luxation retention is indicated, the ſpica ſcapularis bandage, applied ſo as to inveſt the joint, which is eaſily done, and keeping the arm gently bent, and ſuſpended in a ſcarf, will produce it. I have only found this neceſſary in one caſe; in which the ligaments and muſcles ſeemed to have been more than uſually lacerated.

Plate VIII.

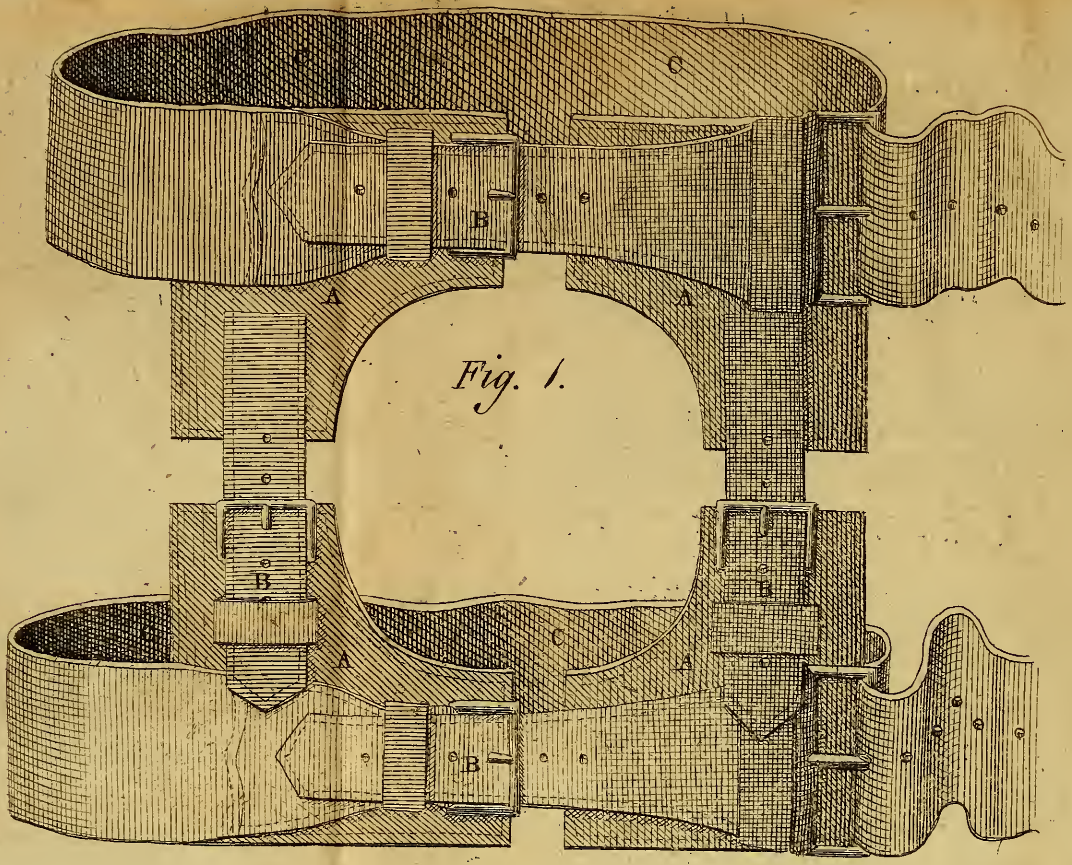
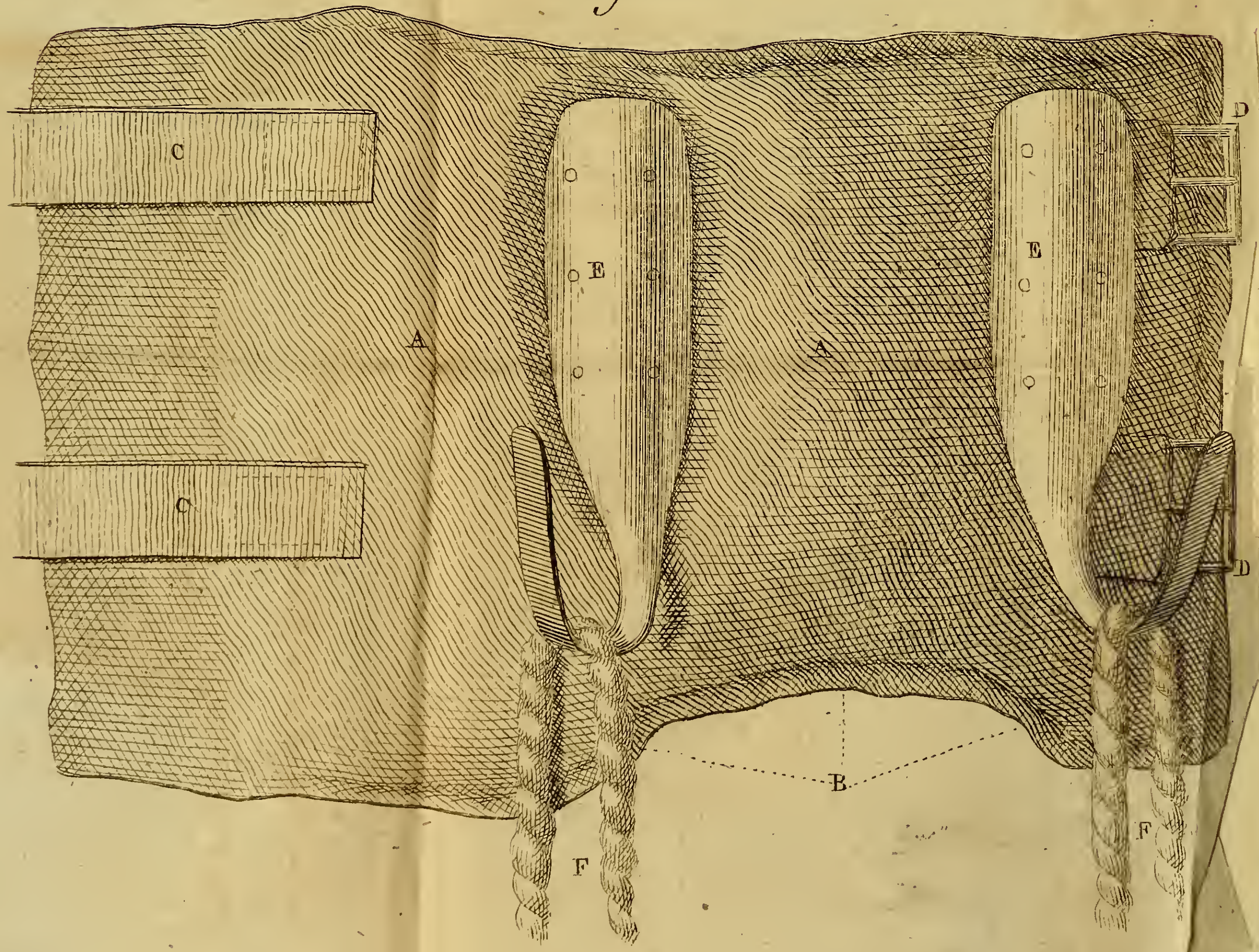


Fig. 1.

Fig. 2.



EXPLANATION OF THE EIGHTH PLATE.

FIG. I. repreſents a bandage for the fractured patella, conſtructed of leather, calculated to ſurround this bone, whatever be its ſize, with any degree of tightneſs; and at ſame time to maintain its ſituation on the leg, whatever be the ſtate of the knee as to extenſion.

AAAA, four ſtuffed pieces, that may be conſidered as compreſſes, connected by the ſhort ſtraps and buckles, in ſuch manner that the diſtances between them relatively may be varied at pleaſure, and conſequently the ſize of the incloſure intended to lodge the patella, exactly adapted to it.

CCCC, two ſtrong leather circulars, with buckles, (they may be ſtuffed, to prevent them from being irkſome), that by ſurrounding the leg, the one above, the other below the knee, effectually maintain the ſituation of the other part of the bandage.

I don't know who is the inventor of this neat bandage; but I have already hinted, that it is not to be truſted without the aſſiſtance of the knee-part of the ſplints formerly deſcribed.

I lately examined a patella of a gentleman that had been fractured about eighteen months ago, and treated by the common bandaging; the diſtance between the fragments is at leaſt five inches: he cannot as yet walk without halting. The long piece of ſupplemental ſoft matter, of the nature of ligament, interpoſed between the pieces, might have been ſuperſeded, or much ſhortened, by the plan of retention recommended above.

Fig. 2. exhibits a view of the lac to be applied above the elbow or knee, in order to favour extenſion, when the arm-bone or thigh-bone is luxated.

AA repreſents a piece of leather, of moderate thickneſs, ſo as to be flexible and pliant. It is here ſuppoſed to be ſomewhat ſtuffed; but I am uncertain about the propriety of this circumſtance; for perhaps it contributes a little to make it loſe its hold more readily than it would if unſtuffed.

B, a notch in the inferior edge of of this piece of the lac, to lodge part of the ſurface of the fore-arm when bent.

CC, two ſtraps which paſs through

DD, correſponding buckles, to be duly tightened when the bandage is about the arm.

EE, two ſtrong iron hooks, placed as deſcribed, to receive the

FF, ropes, or girthing, by which the aſſiſtants are to draw.

Explanation of the Ninth Plate.

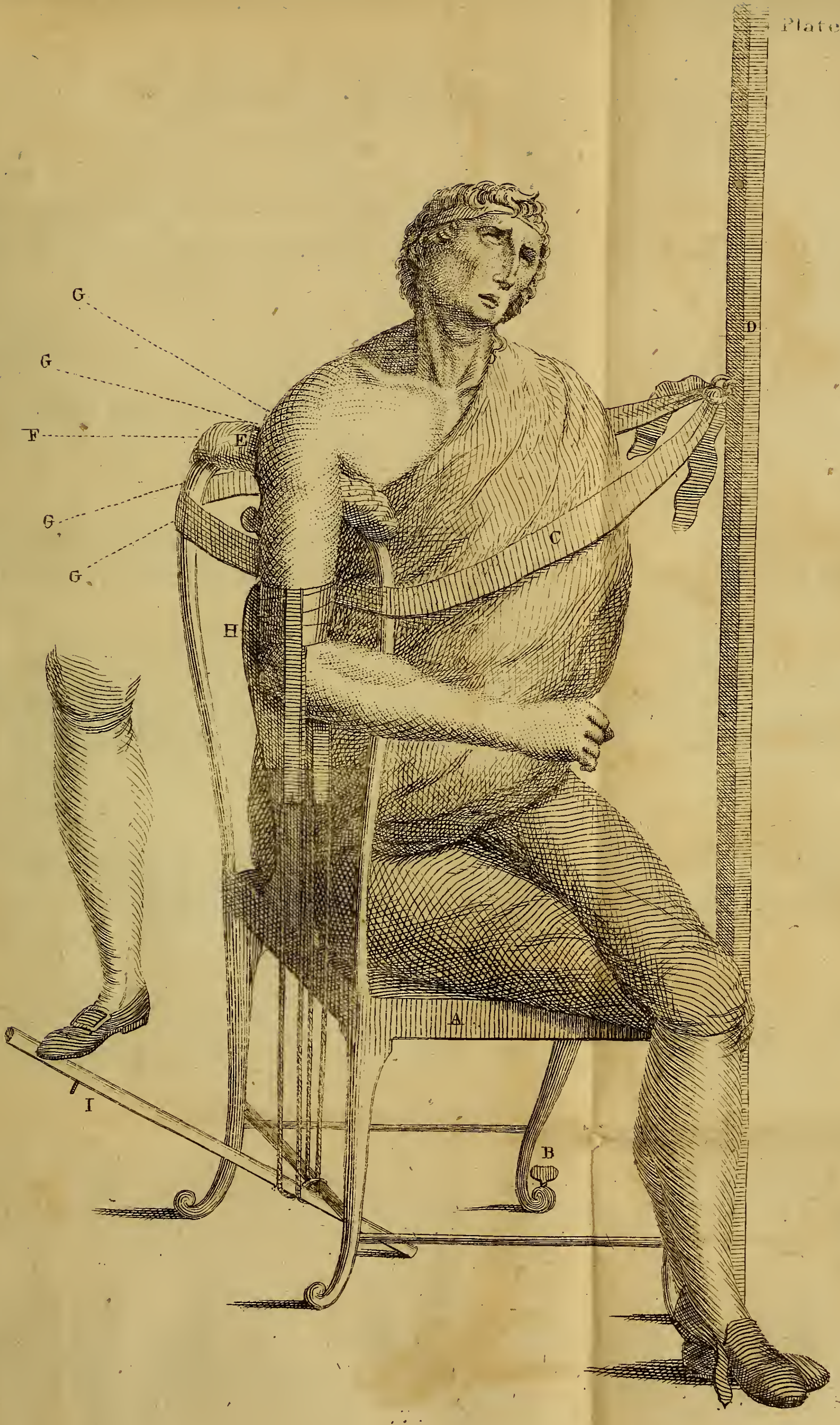
This gives a repreſentation of the patient with a luxation in the right ſhoulder, ſeated on a chair, as deſcribed above, in order to reduction, whether hy aſſiſtants drawing by the lac that is fixed above the elbow, or by the Surgeon alone, by means of the foot-lever.

a, the chair maſſy and ſubſtantial, and fixed by

b, ſcrew-nails through its feet to the boards of the floor, or by

c, a ſtrong belt connected to

d, a poſt, or other fixed point; or by both methods at ſame time.


D
G
G
F
E
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H
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I
B

E, the top of the back of the chair, properly ſtuffed, or covered with a pillow or blanket, reaching to and lodged in the axilla, to prevent bruiſing during the extenſion.

F, the horizontal line paſſing through the axis of the affected joint, in which the drawing may be firſt attempted; and

GGGG, the various degrees of deviation that may be tried, according to the reſiſtance. Succeſs may be chiefly expected while we draw in the downward directions, for the reaſons that have been aſſigned; which is rather a fortunate circumſtance, becauſe it is not eaſy, unleſs the patient be ſeated very low, to draw in the ſuperior directions. This, however, is very effectually and conveniently done by the Ambe deſcribed in the following Plate.

H, the lac formed by the roller and ſtraps formerly taken notice of, which keeps its ſituation very ſecurely during the ſevereſt drawing; and therefore in this reſpect, independent of its ſim-

plicity,

plicity, it is preferable to that deſcribed in the foregoing Plate.

1, the foot-lever, connected by means of ſtrong cords with the lac: the end of it goes under the croſs bar, between the hind-feet of the chair, by which it is counteracted, while the other is depreſſed by the Surgeon's foot. By this means a very effectual extenſion may be produced in the downward direction, eſpecially if the jerking method is adopted. I have mentioned, that I thus ſucceeded, after almoſt every other method had been fruitleſsly tried, in a caſe of thirteen weeks ſtanding.

It has been remarked, that making the arm or diſlocated bone roll about its axis excellently favours the reduction, by diſengaging its head from its new ſituation, and breaking any adheſions that may have been formed, and encreaſing the reſiſtance. This is done by laying hold of the fore-arm near the elbow, and cautiouſly uſing it as a lever, to turn or roll the arm as may be neceſſary.

Plate X.

Fig. 1.

Fig. 3.

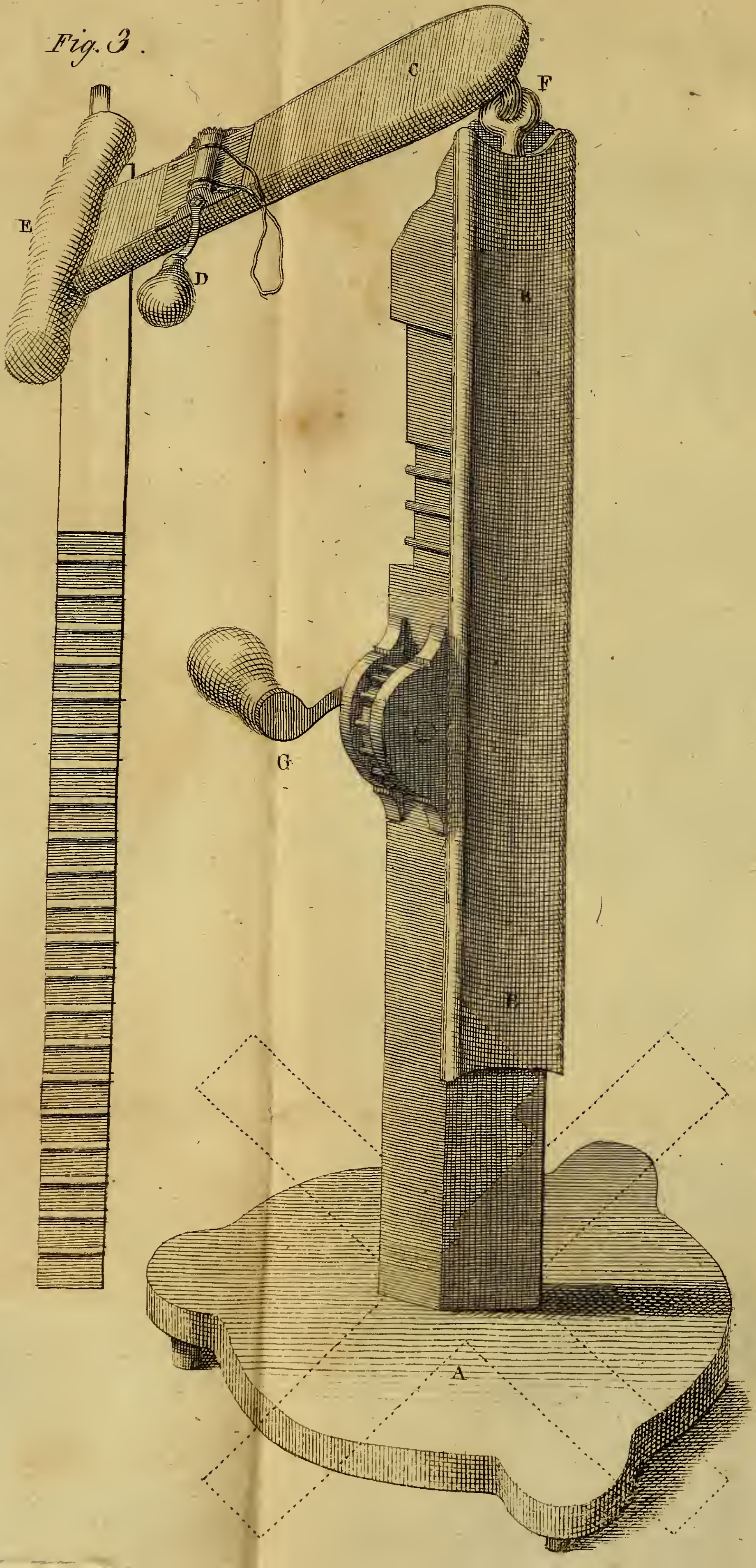
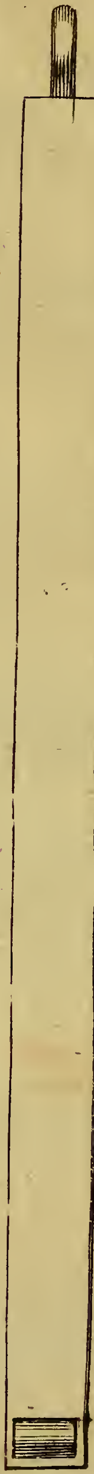


Fig. 2.



EXPLANATION OF THE TENTH PLATE.

THIS Plate repreſents the improved jerking Ambe for reducing the luxated arm-bone.

FIG. I. gives a view of the entire Ambe.

A, the pedeſtal, of a roundiſh form, ſupported on three ſhort feet. It may be made in the ſtyle of a croſs, as repreſented by the dotted lines; which is perhaps the beſt form, as the two pieces making the croſs may be taken aſunder when the fulcrum is removed, and thereby rendered more portable.

BB, the ſide of the fulcrum, to which the patient's ſide is applied, a little hollowed. This circumſtance is not ſtrictly neceſſary.

CC, the lever, of a broadiſh form, and the upper ſurface a little hollowed, the more commodiouſly to lodge the diſlocated arm when its point reaches to the arm-pit. It may, eſpecially at its end, be ſomewhat ſtuffed, to prevent irkſomeneſs and contuſion.

D, the little windlaſs on the lever, at ſuch a diſtance from its rounded end as to allow the arm of the talleſt man to lie on it bent, ſo that the cord connected with it may reach the lac above the elbow.

E, the croſs head of the lever, to be occaſionally ſeized by both hands of the Surgeon, ſo as to enable him to roll the patient's arm about its axis, for the purpoſe formerly mentioned.

F, the univerſal joint, which conſiſts of two loops: the upper one paſſes through the lever, and is riveted into a ſmall iron plate, concealed by the ſtuffing, ſo as to allow the lever to move freely in a horizontal circle. The under one is formed in the top of the iron bar that is lodged in the fulcrum. Thus a combination of the motions permitted between the two loops, and between the upper one and the extremity of the lever, produces the motion in all directions; and conſequently a great deal of the efficiency peculiar to this ambe.

G, the greater windlaſs fixed on the fulcrum, ſo that its teeth, which ſhould be of iron, and juſtly made, catch on thoſe of the iron rod, repreſented in the third figure of this Plate. By turning the handle, therefore, in one direction, the iron bar is neceſſarily and proportionally projected from its ſheath in the fulcrum; and conſequently the patient fixed to the lever by the luxated arm, as deſcribed, is elevated from the pedeſtal of the ambe, and ſuſpended; and, by turning the oppoſite way, the rod is retracted into its ſheath, and the patient allowed to deſcend. If this motion is performed ſuddenly, it gives the jerk, that ſo effectually contributes to deſtroy reſiſting adheſions in inveterate caſes.

Fig. 2. exhibits a view of the iron bar retired from its ſheath. It ought to be ſufficiently ſtrong to ſuſpend the heavieſt man without danger of bending, and of ſuch length as to allow a projection of eighteen inches or two feet, for the purpoſe of ſuſpending and jerking.

H repreſents a ſmall friction-wheel lodged in the inferior end of the rod; and on its ſide oppoſite to the windlaſs, to facilitate its motion. Another, nearly ſimilar, is placed at the upper part of the ſheath, correſponding to the ſame ſide, for the ſame purpoſe.

It will be underſtood, that the power of raiſing the patient is as the diameter of the the wheel of the windlaſs, and the length of its handle, i. e. the leſs the former, and the longer the latter, the greater the power; ſo that the weakeſt operator may thus, with one hand, eaſily raiſe the heavieſt patient; eſpecially with the aſſiſtance of the two friction-wheels placed as mentioned.

FIG. 3. repreſents the teethed ſide of the lever, that it may be underſtood how it is affected by the teeth of the pinion when in its ſheath, as deſcribed.

It has been mentioned, that the two pieces forming the croſs pedeſtal of this Ambe may be taken aſunder, and thereby rendered more portable than the round pedeſtal. It may be now added, that the lever connected with the iron bar, and the fulcrum retired from its ſocket in the pedeſtal, may be packed with the croſs pieces, ſo as to be abundantly portable on a man's back on a horſe, or behind a carriage: A circumſtance extremely convenient when the patient cannot be brought to it.

This ſocket perforates both pieces of the pedeſtal, and the tenon is ſecured by a horizontal plug, formed ſomewhat like a wedge, that ſecures the fulcrum againſt any motion with reſpect to the pedeſtal.

In my opinion, Mr Freck has in a great meaſure deſtroyed the utility of his modification of the Ambe by his anxiety to make it very eaſily portable. A machine of this nature muſt be ſubſtantial; and any one leſs ſo than that now deſcribed will be found to be ſo far diſqualified to produce its due effect.

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OF LUXATION IN THE HIP-JOINT.

IN order that our bodies might enjoy the neceſſary ſtability in the various attitudes, it was abſolutely requiſite that the inferior extremities or legs ſhould be ſecurely anticulated to the trunk, while they poſſeſſed a very ample ſhare of motion. Accordingly we find, that the acetabula, or deep ſockets, that receive the heads or balls of the thigh-bones, are wrought in lateral and ſomewhat anterior points of the oſſa innominata, or haunch-bones, which finiſh the ſkeleton of the trunk below.

The ball of the thigh-bone is fixed in the acetabulum, not only by the common capſular ligament, peculiarly ſtrong, but by an internal ligament of great ſtrength. Theſe unqueſtionably muſt be lacerated when a diſlocation of the head of the thigh-bone takes place, which is called luxation in the hip-joint.

Nature has guarded againſt luxation in this joint, not only by its ſtrong ligamentous apparatus, but by the depth of the ſocket, eſpecially at its upper and poſterior parts, where the weight of the trunk and burdens is thrown in the ſtanding and ſtooping attitudes, and alſo by the attachment of ſtrong and ſhort muſcles near it; which muſt be greatly ſtretched, deranged, and perhaps partly lacerated, when luxation takes place.

It will now be underſtood, that great external violence in general will be neceſſary to be the occaſional cauſe of idiopathic luxation of the thigh-bone. Indeed ſometimes a ſmaller weight or ſtroke than might be ſuppoſed adequate has this effect, when they chance to act ſo that the thigh-bone aſſiſts them as a long lever.

Beſides the common ſymptoms, the luxation in queſtion is diſcovered by the ſhortening of the correſponding leg, and the altered poſition of the foot or toes.

The leg is neceſſarily ſhortened in all luxations of the thigh-bone, in which the head of it ſlips above the level of its ſocket. Indeed this change is not peculiar to this luxation; it takes place in that of the arm-bone, although not ſo remarkably.

The altered poſition of the foot and toes is a good deal characteriſtic of luxation of the thigh-bone: in general, with reſpect to a vertical plane, which we may ſuppoſe to divide the body into lateral halves, the toes, or point of the foot, are turned more or leſs inwards; eſpecially when the diſlocated ball has mounted on the dorſum of the os innominatum, owing to its projection from the axis of the body of the bone, and the action of the muſcles attached near it.

The diſlocated ball is ſometimes lodged on the brim of the pelvis, under Paupart's ligament, and can be eaſily felt in the groin. I think I once diſcovered it in an inveterate caſe under the arch of the pubes. In ſome inſtances, the ball may incline ſo much backwards as to be ſomewhat in or near the iſchiatic notch.

All theſe ſpecialities are to be diſtinguiſhed by very careful examination, and anatomical information.

It was formerly mentioned, that luxation might be miſtaken for fracture near a joint; and, vice verſa. Accordingly fracture of the neck of the thigh-bone, to which its almoſt tranſverſe poſition renders it peculiarly liable, and luxation in the hip-joint, have been often confounded. The peculiar grating of the fragments, which marks fracture, is ſufficient to give a diſcrimination.

The requiſite extenſion to reduce the luxated thigh-bone muſt be great, and conſequently comparatively difficult, on account of the ſtrength of the numerous muſcles, that, by their uſual as well as morbid action, gives reſiſtance.

Without attempting to recount the various projects and machines that have been deviſed for extenſion of the luxated thigh-bone, I ſhall content myſelf with explaining the methods of doing it that I have found to be the moſt ſimple and efficient.

The patient is laid with the affected ſide uppermoſt, on a table covered with a matraſs or blankets, or both, and his body is rendered immoveable, with reſpect to the extending power, by connecting it ſecurely with a fixed point on the oppoſite ſide of the room. This is much preferable to what has been called counter-extenſion by aſſiſtants, to prevent the patients yielding or ſhifting place during the extenſion.

Having often ſeen the extending efforts baffled by this circumſtance in our Infirmacy, I ordered a ſtrong ring to be fixed in the railing, a little higher than the table on which the patient is laid, I then connected him ſecurely to it, in the following manner, which may be done in any room.

A rolling-pin, of ſufficient length, with its middle part well covered with doublings of flannel, is placed in the pærineum, or applied to the bottom of the pelvis: the ends of a ſtrong piece of girthing, the middle of which is fixed in the ring already mentioned, are reſpectively tied to the extremities of the rolling-pin. Between the flannel around the rolling-pin and the pærineum, a bunch of tow or wool may be interpoſed, to give as much ſecurity as poſſible againſt contuſion.

It will be underſtood, that by this plan the patient is rendered immoveable with reſpect to the extending power, which neceſſarily gives it full effect. Accordingly I believe the other Surgeons of our Hoſpital have ever ſince adopted it.

A ſufficient number of ſtrong aſſiſtants conſtitutes, I think, the moſt truſty extending power. They draw by ropes or girthing, of ſufficient length, fixed to the affected thigh, while the knee is bent, by means of the lac already deſcribed; which ſeems to be indiſpenſible in this buſineſs, on account of its maintaining its ſituation, altho' the extenſion be very great. It is accordingly now the only lac uſed in our Hoſpital.

While the extenſion is performing, the Surgeon ought to ſtand behind the patient, to regulate, with great judgement and caution, every circumſtance, particularly the degree and direction of the drawing.

It has been remarked, that as well in fracture as luxation, we ſhould begin with low or gentle degrees of extenſion, and encreaſe it gradually, and only as the reſiſtance may indicate. The requiſite degree in any aſſignable caſe can only be determined by ſtrict attention to circumſtances; which therefore demand due vigilance from the Surgeon. In general, however, I may venture from experience to ſay, that he ought not to be too timid and unperſevering, otherwiſe he may abandon the trial in the moment when a little more power and patience would have crowned his wiſhes.

I have never ſeen any bad effects from what ſome would perhaps deem over-extenſion. I can ſcarcely conceive, that there can be any almoſt in any caſe; the reſiſting ſubſtance, whatever it be, muſt yield, and be deſtroyed, before the muſcles, or veſſels in general, can be much ſtretched or injured.

As was obſerved concerning the arm, while extenſion is proceeding, the knee being bent, the leg is laid hold of by the Surgeon, with both his hands, near the knee, and employed as a lever, to roll the thigh-bone about its axis, for the purpoſe repeatedly taken notice of.

The patient always complains loudly of the preſſure or re-action of the rolling-pin on the perinæum, however well it be covered, which the Surgeon muſt endeavour to alleviate as much as poſſible.

It will immediately occur, that inſtead of the covered rolling-pin, a cuſhion, properly ſized, and fixed to the girthing, may be employed.

The former, however, will in general be preferable, on this account, that in obſtinate caſes, while the extenſion is ſtrong, the Surgeon can lay hold of the ends of it, and make an effort to raiſe the head of the bone to the level of the ſocket, to facilitate the reduction; which I once obſerved to ſucceed. Indeed this can be done, altho' the cuſhion be adopted.

After trying the horizontal direction, if neceſſary, the ſuperior and inferior ones, as was obſerved with reſpect to the luxated arm-bone, may be tried; and the aſſiſtants ſhould be previouſly inſtructed to act in concert, and to vary the line in which they draw regularly when ordered.

The moment the luxated bone is retracted to the level of its ſocket, it cannot fail, provided the extenſion is remitted, to re-occupy it; and in recent caſes it gives it an audible ſtroke; but in inveterate ones, on account of the ſocket's being ſomewhat changed by the abſence of the uſual preſſure, this is leſs remarkable, and ſometimes altogether imperceptible. In every caſe, however, when the limb has regained it due length, and the foot its proper poſition, and retains them, although the extenſion ceaſe, we may be certain we have ſucceeded.

The moſt truſty extending power, I have ſaid, is that of aſſiſtants; but it may be remarked, that when neceſſary a ſufficient one may be produced mechanically by the axis in peritrochio, or a windlaſs of proper ſize placed before the table on which the patient is laid, and fixed to the floor, or other immoveable ſurface. By connecting this with the cords from the lac, a well-regulated horizontal extenſion may be produced; and if the windlaſs is connected with a frame, forming a part of a verticle circle, of which the diſeaſed joint is the centre, it may be ſuddenly ſhifted upwards and downwards on the circle, without ſlackening the extenſion; and conſequently any requiſite degree of varied direction obtained at pleaſure.

It is not to be expected, that the private practitioner ſhould have an apparatus of this kind. I think, however, there ſhould be ſuch a one in every Hoſpital. Accordingly I have provided one adapted to the operation-room of our Infirmary.

I can ſcarcely ſuppoſe, that retention will be difficult in any caſe of this luxation, for the moſt obvious reaſons. However, when neceſſary, it may be conſulted and obtained by the ſpica inguinalis bandage, joined with proper poſture, and abſtinence from motion of the affected limb for ſome time.

OF LUXATION IN THE ELBOW.

THE articulation of the elbow reſembles the common hinge, in ſo far as it poſſeſſes only flexion and extenſion, and thoſe to ſuch degree that the hand, in performing them, ſcarcely moves through a ſemicircle.

This limited motion of this joint, depending principally on the conformation of the extremities of the bones forming it, agreeably to the general principle ſtated above, renders luxation of the elbow comparatively unfrequent.

When luxation exiſts here, the extremities of the bones of the fore-arm are either retracted unduly behind, or projected, before the correſponding one of the arm-bone, and therefore muſt be very eaſily diſcoverable.

Upon the ſuppoſition that the luxation is backwards, the patient's arm being gently bent, the Surgeon with one hand lays hold of the arm, and with the other the fore-arm, both near the elbow, and makes an effort to retract the bones of the latter, depreſſing them ſo that the coronoid proceſs of the ulna may be ſomewhat freed from contact with the pully, or trochlea of the os humeri, or arm-bone. By this means the retraction is facilitated. When the patient is robuſt, it will be neceſſary to have an aſſiſtant to ſecure the arm, while the Surgeon exerts his whole force to retract the fore-arm.

If the luxation is forwards, (which is a rare caſe, and in the opinion of ſome the olecranon is for the moſt part fractured), an effort muſt be made, while the arm is firmly held as deſcribed, to depreſs the luxated extremities of the bones of the fore-arm, ſo that the olecranon may repaſs the pully of the arm-bone, and regain its ſituation. The olecranon's being ſeparated by fracture from the reſt of the ulna, will rather favour than retard the reduction.

I treated a caſe that may be called a compound luxation in the elbow. The bones were not only diſplaced, but there was a wound and fracture of the neck of the radius; by which its head was ſo detached, that I judged it proper to remove it. A cure followed, and a ſurpriſing ſhare of the motion was preſerved.

OF LUXATION IN THE KNEE.

THE ſurfaces included within the capſular ligament of the knee are greater than thoſe of any other joint; and the motion is ſcarcely ſo extenſive as that of the elbow: therefore, according to the general principle formerly ſtated, that the frequency of luxation, other circumſtances being equal, is as the quantity of motion, it may be concluded, that it will ſeldom be the ſeat of diſlocation. This is accordingly found to be ſo in fact.

The unfrequency of diſlocation in the knee farther ariſes from the reſiſtance of the croſs ligaments within the joint, the preſence of the ſemilunar cartilages, the broad tendon, that almoſt entirely inveſts it, and the muſcles that either paſs immediately over it, or have their tendons inſerted near it.

From the premiſed circumſtances, it will be evident, that great external violence alone can be the occaſional cauſe of luxation in the knee; and that much ſtrain and very extenſive laceration of the ligaments, &c. muſt attend it.

It farther follows, that the luxation in queſtion will be eaſily diſcovered, and as eaſily reduced.

Of Luxation in the Wrist.

THE Wriſt is a kind of the ball and ſocket joint, and conſequently has motion in all directions. The ball is formed by the upper carpal bones; and the correſponding extremity of the radius ſupplies the ſocket.

Luxation in this joint is moſt commonly produced by the ball mounting more or leſs on the external ſurface of the ends of the fore-arm bones. In conſequence, the arm is ſhortened, and two tumors appear on the external and internal ſurface, near the wriſt; the one cauſed by the diſplaced ball, and the other by the ends of the bones of the fore-arm, which in one inſtance I ſaw protruded through the ſoft parts, and ſomewhat flattened by the violence of a fall from a high houſe. This is a caſe of compound luxation before alluded to. The perſon recovered, but with great loſs of motion in both wriſts, for both were thus affected.

The reduction cannot be difficult, when the fore-arm is firmly held; while the requiſite extenſion is effected by drawing by the hand, and moving the diſlocated ball, to facilitate the operation.

OF LUXATION IN THE ANKLE.

THE Ankle is a hinge-formed joint, poſſeſſing, along with flexion and extenſion, a conſiderable lateral motion. The upper part of the aſtragulus is received, into a correſponding excavation, in the end of the tibia, guarded on one ſide by a ſtrong proceſs of the tibia, commonly called the inner ankle; and on the other ſide, by the extremity of the fibula, which is the outer ankle.

A backward or forward luxation takes place in this joint, according as the aſtragulus (and conſequently the foot) is puſhed unduly behind or before the correſponding end of the tibia. In the former, the heel ſeems to be lengthened, and the foot ſhortened; and in the latter, the contrary.

The reduction is eaſily effected, by drawing by the foot, while the leg is firmly ſecured againſt motion, and, when from the reſiſtance it ſeems to be neceſſary, the knee ought to be ſomewhat bent.

APPENDIX.

OF THE CLUB-FOOT.

THE Club-foot partakes very much of the nature of a Luxation in the ankle: in fact, it may be conſidered as a lateral diſlocation in this joint, produced, in my opinion, by a mal-poſition, or undue croſſing of the legs in utero, by which the evolution of the inner ankles (proceſſes of the tibiæ as mentioned) is hampered, and the aſtraguli are not duly confined in their excavations, ſo that the ſoles are turned towards one another; and in the ſtanding attitude the body reſts on the outer edges of the foot, and ſometimes on the outer ankles. In ſome inſtances this affection is extended to the knee; and in others, comparatively few, it is accompanied with a withering or ſhrinking of the leg and thigh.

This diſeaſe or deformity, when confined to the ankle, or perhaps extended ſomewhat to the knee, admits of a cure on the ſame principle as luxation, provided we begin our attempts early; that is, as ſoon after birth as poſſible, and perſevere duly.

The reduction, or replacing of the foot, is an eaſy buſineſs. The whole taſk of the Surgeon, therefore, almoſt conſiſts in retention, that the evolution of the faulty parts may be favoured, and at laſt completed.

The retentive means, that they may be effectual, muſt be the moſt ſimple, giving to the infant as little pain, and to the nurſe as little inconvenience, as poſſible. The machine repreſented in the firſt figure of the eleventh Plate is of this deſcription. It is ſoftly lined and quilted, when the foot is placed in it; and it ſhould be well adjuſted. It is ſhut and ſecured by a ſtrap or ribband. It muſt be very conſtantly worn; and being made of hardened leather, or of tin or copper plate, it is impenetrable to moiſture, which is a great circumſtance of convenience.

When the knee is affected, two ſplints, lined and quilted, and properly adjuſted, muſt be worn for the requiſite time. Theſe lay hold of the knee, and keep it, the leg and foot in their due relative poſition.

Of the Supple-Joint.

AN undue luxity of the ligaments, allowing involuntary motion, has moſt frequently occurred in the ankles.

In ſuch a caſe, the machine repreſented in the third figure of the eleventh Plate has been found to produce eſſential ſervice.

It will be obſerved, that it much reſembles that formerly recommended for the fractured leg:

There is this difference, however, the ſplints are ſo connected with the heel of the ſhoe, that while flexion and retention are permitted, the lateral or hurtful motion is entirely prevented.

EXPLANATION

EXPLANATION OF THE ELEVENTH PLATE.

FIG. 1. is a repreſentation of the machine for the club-foot, when the affection is confined to the ankles. It much reſembles the boot of Hildanus.

FIG. 2 exhibits a view of the ſplint recommended, when, along with the club-foot, the knee is more or leſs affected. The ſplints, as they are to be long worn, muſt be well adapted, and the lining very ſoft, and quilted.

FIG. 3.

Fig. 1.

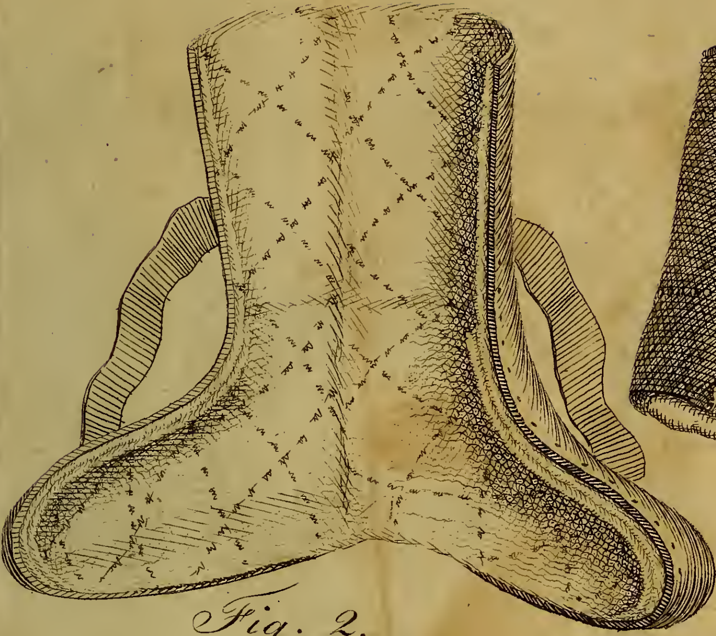

Fig. 2.

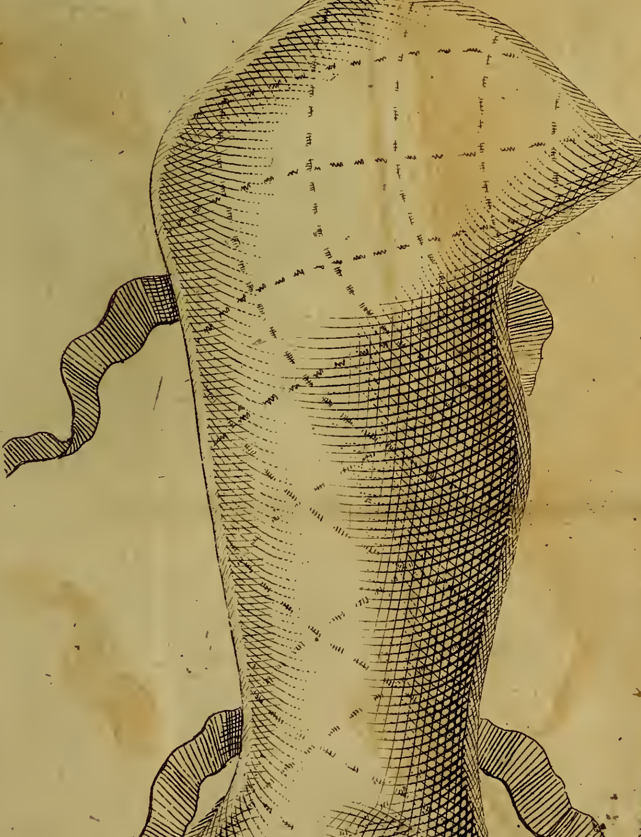

Fig. 3.

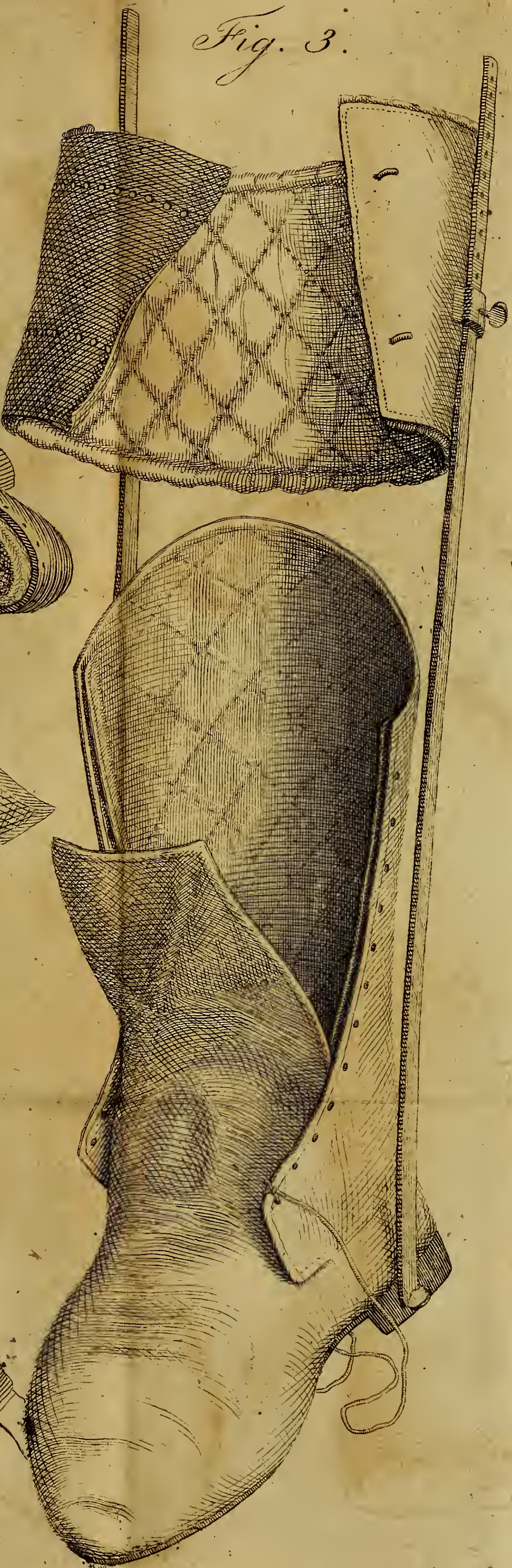

FIG. 3. gives a view of a machine for ſecuring the ankle, in caſes of too great flexibility, againſt lateral motion.

THE END.

ERRATA.

Page	line	
16.	10.	FOR where READ when
38.	3.	AFTER under INSERT them
76.	1.	FOR this READ theſe
80.	14.	LEAVE OUT occaſion
87.	5	FOR two READ other
114.	1.	AFTER primary INSERT diſeaſe
115.	12.	FOR luxated READ lacerated
121.	4.	FOR gloinid READ glenoid
126.	8.	AFTER which INSERT there is a
130.	17.	FOR probable READ portable
131.	15.	FOR near READ new

DIRECTIONS FOR PLACING THE PLATES,

Plate		Page
1.	to face	86.
2,	-	88.
3.	-	ib.
4.	-	90.
5.	-	ib.
6.	-	98.
7.	-	100.
8.	-	138.
9.	-	140.
10.	-	146.
11.	-	172.

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